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EXTILE CHEMISTS
ND COLORISTS

AMERICAN

DYESTUFF REPORTER

Diagen* Colors for Printing!

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Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

The Processing of Linen Piece Goods in the United States 709
O. W. Clark

The Textile Chemical Uses of Sulfamic Acid..... 729
J. Wakelin

Textile Patents and Trade Marks..... 731
Harry Price

• Departments

Trade Notes—New Products..... 735

Open Forum 736

• Proceedings of the American Association of Textile Chemists and Colorists

Calendar of Coming Events..... P715

Paul Krais P715

The Management and Operation of a Hosiery Dyehouse P716
A. G. Alexander and Clarence Wille

Meeting, Philadelphia Textile School Student Section. P721

1939 versus 1914..... P722
W. F. Van Riper

Unemployment Register P724

Report on Project No. 2, Inter-Society Color Council.... P725

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AMERICAN
DYESTUFF REPORTER

VOLUME 28 DECEMBER 11, 1939 NUMBER 25

The Processing of

Linen Piece Goods

in the United States

O. W. CLARK*

PRIOR to 1927 only a small yardage of linen piece goods was dyed in the United States with any type of dyestuffs, and an extremely small percentage of the yardage was dyed with fast colors. In general, the quality of dyeing exhibited by the imported linen was very inferior; the penetration was exceedingly poor, the color was loosely fixed, and the slubs were darker than the body of the fabric. It was not unusual to find in each bolt of dyed linen, a printed statement to the general effect that the color was a surface dye and that extreme care must be used in washing the fabric.

The advent of rapid style changes, and the increased advertising emphasis upon specific color names which changed with the style seasons, soon rendered obsolescent the fabric stocks dyed in unpopular colors, and focussed attention on the advisability of increasing the yardage of linen dyed in the United States, so that the lag between the placing of an order and the delivery of the dyed fabric might be reduced from months to a week or so. The inventory investment became of real importance when the depression years brought a smaller profit margin and no longer could dead stocks of unpopular shades be countenanced. Recognition of the fact that an intrinsically valuable fabric such as linen merited high quality dyeing, together with an increased consumption of linen fabrics in cruise and sports apparel directed attention to the advantages of utilizing fast dyes. The result was that the ensuing years saw a steadily increasing yardage of linen dyed in the United States and much of it with fast dyes.

The dyeing of linen fabrics is a rather difficult job. The varied sources of the raw flax and the somewhat empirical methods used in the retting, scouring, and bleaching of the fiber, are not conducive to the production of a fabric with uniform properties throughout a large yardage, nor even from web to web, nor at times from filling change to filling change within the same web. Never can the linen dyer assume that his processes and formulas are so standardized that the resultant product will exactly check from lot to lot.

Constant and meticulous supervision must be lavished on the processing of linen fabrics. Each quality of linen fabric, even though of the same apparent construction, if from different manufacturers, requires its own set of dyeing formulas, and these are really just a fairly close guide and will not exactly reproduce from lot to lot. The best judgment of the most experienced dyers is often severely tested in the production dyeing of fast color linen fabrics.

Shade matching requirements are very exacting. The linen importers insist on merchandising a first quality fabric. A large yardage of linen is consumed by the cutting up trade where mass production methods require uniform shades adhering closely to the standard. Complete formula files with attached cloth swatches representing the various steps in the dyeing procedure are of great assistance in close and rapid shade matching. In vat dyeing, for example, the formula card contains a trial padder patch, a hand oxidized and soaped patch cut from the reduced cloth on the jig showing the shade at the point when the jig roll was released for the oxidation procedure, a patch from the completed dyeing showing the shade at the point where the jig roll was released for drying, and a final patch showing the shade of the cloth after all finishing treatments had been applied. The real key to the successful dyeing of linen is close supervision over all details of dyehouse operation.

In describing the methods of processing the various types of linen fabrics, detailed formulas and step by step procedures will be given in the expectation that a clearer insight into the variation in methods and basic procedures will thereby result than could be conveyed by prolonged pure exposition.

The bulk of the linen imported for dyeing is loom-state dress linen. It is received in webs averaging 95 yards in length and in the condition in which it left the

*The Calco Chemical Co., Inc.

loom; that is, the yarn had received about a three-quarter bleach before weaving, and the cloth contains any sizing materials added before weaving, and random dirt and stains gathered during the weaving operation. Sometimes it contains added filling materials to disguise inferior quality yarns. The fabric weighs about 4 ounces per yard and contains in the vicinity of 40 threads per inch. The finest qualities come from Ireland and other grades come from Belgium, Russia, and Czechoslovakia.

A considerable yardage of linen is comprised by sheer and cambric linens, usually imported in full-bleached, white-finished 95 yard webs, so that only one stock has to be carried by the importer and diversion to either colored or white sales can be made in conformity with the demand. A small yardage is imported loomstate for dyeing only. It is not economically feasible to produce a brilliant white finish in this country from loomstate sheer yarns. The sheer and cambric linens weigh from about 1½ to 3 ounces per yard.

Suiting linens running from 6 to 12 ounces per yard are imported both loomstate and white-finished, but the white finished linen rarely dyes satisfactorily, due probably to previous processing which chafes the fiber, produces crack marks, or even degrades the cellulose. Loomstate linen is therefore preferable for dyeing, because the scouring and bleaching can be correctly executed in the open width by the dyer.

A large yardage of cambric linen utilized in the mass production of cheap handkerchief linen dresses with low cost the prime requisite and color fastness secondary, is dyed in pastel shades with direct dyes. Typical of the cheap direct dyes used are Sky Blue 6B, Scarlet 4BA, Orange S, Chrysophenine, Blue RW, Brilliant Violet B, Rhoduline Red B, Catechine 3G, and Black L; all colors well suited for high speed padding. The webs of cambric are sewed and beamed into 1,500 yard rolls, and without any preparatory treatment, are padded at a speed of 150 yards per minute and can dried. The padding liquor is made up at a boil in the feed tank with the dyestuff, a wetting-out agent effective at high temperatures; and, if desired, a small amount of sulfonated oil and gum tragacanth to maintain or produce a suitable finish on the fabric. The fabric passes through the dye liquor maintained at 200° F. in a small immersion padder trough of about 4 gallons capacity.

Darker shades on this low price dress line are jig dyed with diazotized and developed dyes, with sulfur dyes, or with naphthol AS dyes, whichever give the cheapest results. The darker shades usually are not included in this low price line, but are included in the next quality group.

Typical procedures for dyeing these low priced shades with the various types of suitable dyes follow:

Light Blue on 3,000 Yards of Cambric Linen

Sky Blue 6B....	1 lb. 8 oz.
Gum trag. 1:20..	2 gallons
Soluble pine oil..	1 quart
Boiled up to.....	50 gallons in padder feed tank

pad at 150 yards per minute and can dry. If the cans are in series with the padder a short skying of the cloth between padding and drying will facilitate dye absorption and minimize color migration during drying. If the dyed cloth is batched before can drying it is beneficial to allow some time to elapse before can drying.

Dark Green—Diazotized and Developed

on a 1,500 yard roll of cambric weighing 215 pounds.

The jig is prepared with 100 gallons liquor at a boil containing the following ingredients:

Diazo Green	6 lbs.
Diazo Yellow	2 lbs.
Wetting-out agent	2 lbs.

The dry cloth is entered into the dyebath containing all the dyebath and run as follows:

End

1. Run dry cloth into gently boiling dyebath.
2. Run back through residual dyebath.
3. Add 10 lbs. calcined Glauber's salt and run back.
4. Add 10 lbs. calcined Glauber's salt and run back.
5. Rinse in running cold water.
6. Rinse in running cold water.
7. Run cloth through a full jig of cold water containing 2.5 lbs. of sodium nitrite and 7½ pints of hydrochloric acid.
8. Run back after adding 2.5 lbs. of sodium nitrite and 7½ pints of hydrochloric acid.
9. Rinse in running cold water.
10. Rinse in running cold water.
11. Rinse in running cold water.
12. Run cloth through ½ a jig of cold water containing 2.0 lbs. of Developer Z dissolved with 2.0 lbs. soda ash.
13. Run cloth back after adding 1.0 lbs. Developed Z dissolved with 1.0 lb. of soda ash.
14. Rinse in running cold water.
15. Rinse in running water at 120° F.
16. Run cloth through a full jig of gently boiling water containing 2.0 lbs. of soap flakes.
17. Run cloth back.
18. Rinse in running hot water at 140° F.
19. Rinse in running hot water at 140° F.
20. Shell up cold.

Diazotized and developed dyes produce a very flat, dull shade of navy on linen and for a cheap navy recourse is had to sulfur dyes.

Sulfur Navy on a 1,000 Yard Roll Weighing 150 Lbs.

The roll is tenter framed before dyeing. The jig is prepared with 80 gallons of water at a boil containing the following ingredients:

Sulfur Direct Blue	22.0 lbs.
Sodium sulfide crystals	44.0 lbs.
Soda ash	10.0 lbs.
Soluble pine oil	2.0 lbs.

End

1. Run dry cloth into gently boiling dyebath.
2. Run back through residual dyebath.
3. Add 5 lbs. of calcined Glauber's salt and run back.

4. Add 5 lbs. of calcined Glauber's salt and run back.
5. Rinse in a copious flow of cold water.
6. Rinse in a copious flow of cold water.
7. Rinse in a copious flow of cold water.
8. Run cloth through ½ a jig of water at 140° F. containing 3.0 lbs. of sodium perborate.
9. Run cloth back after adding 1.0 lb. of sodium perborate.
10. Rinse in running hot water at about 140° F.
11. Rinse in boiling water.
12. Shell up through cold water.

Notes

1. The sulfur dye and chemicals are dissolved by boiling up in 30 gallons of boiling water.

2. It is advisable to complete the dyeing operation in four ends rather than to attempt to utilize every possible bit of dye by running more ends and risking dark or oxidized selvedges as the edges of the roll deviate from exact coincidence and as the reduction potential of the dyebath decreases.

3. Addition of too much salt in the effort to drive all the dyestuff on to the fiber may result in dark selvedges and in poor fastness to crocking.

4. The dyeing can be oxidized with sodium bichromate and acetic acid if a duller shade is permissible and if maximum wash fastness is desirable.

Red shades are usually dyed with azoic dyes using the cheap naphthol AS and a suitable fast color salt. The yardage is usually not sufficient to warrant range dyeing with its economy and simplicity and so the cloth is padded with the naphthol and dried, preferably in a roller hot flue, but cans are suitable if not too hot and if they are sufficient in number to allow for a fairly high rate of cloth passage. The naphtholated cloth is then developed on the jig.

Red on 3,000 Yards—450 Lbs.—2 Rolls of Cambric

Beta-hydroxy naphthoic acid anilide..	8.0 lbs.
Suitable solvent B.P. over 212° F.....	12.0 lbs.
Dry caustic soda.....	3.0 lbs.
Non-foaming wetting-out agent.....	2.0 lbs.

The first three ingredients are pasted well together, four gallons of boiling water is added, and the mixture stirred until solution is complete. It is then made up to 60 gallons at a boil in the padder feed tank and the wetting-out agent added. The cloth is dip padded at 150 yards a minute through a 4 gallon padder trough maintained at 200° F. The high temperature produces a very soluble naphthol without tendency to exhaust during the run and it also facilitates penetration. After careful drying the cloth is coupled in the jig.

Each jig is prepared with 80 gallons of cold water containing per roll:

Stabilized diazo salt of 4 chlor-2 nitro aniline	15.0 lbs.
Dispersing agent compatible with above	0.5 lbs.
Common salt	20.0 lbs.

The dried naphtholated cloth is entered into the jig and run as follows:

End

1. Run dry cloth into jig.
2. Run back through residual dye shelling up so that the squeezing action will aid the penetration of the cold developing liquor.
3. Rinse in running cold water.
4. Rinse in cold water containing 1 quart of muriatic acid.
5. Rinse in running cold water.
6. Run the cloth through a full jig of gently boiling water containing 5.0 lbs. of soap flakes, 3.0 lbs. of soda ash, and 0.5 lb. of a synthetic detergent.
7. Run back.
8. Run the cloth through a full jig of gently boiling water containing 1.0 lb. of a synthetic detergent.
9. Run back.
10. Rinse in boiling water.
11. Rinse in boiling water.
12. Rinse in boiling water.
13. Shell up in cold water.

Notes

1. The naphtholated cloth should not be overdried and should be allowed to cool down before developing.

2. Just before use the stabilized diazo salt of 4 chloro-2 nitro aniline is pasted up with the dispersing agent and a small amount of water at 90° F., and cold water is immediately added with stirring until solution is complete. The solution is strained into the jig containing the dissolved common salt.

3. A short, vigorous soaping is more effective than a prolonged soaping in a weaker liquor in producing a crock-resistant fabric.

The better grade cambric linens and the expensive sheer linens used in the manufacture of high quality wearing apparel and for applique work are dyed with fast colors, utilizing vat, stabilized leuco vat, naphthol AS homologues, and occasionally sulfur dyes. Usually the cloth is dyed without preparatory treatment, but occasionally for dark shades which possess a tendency to crock, the cloth is desized with enzymes before dyeing. The stabilized leuco vat dyes, combining excellent fastness, penetration, and levelness, with simplicity of application, are ideal for the dyeing of light shades with a reasonable overall dyeing cost. The yardage per shade is usually insufficient to warrant the use of the very efficient modern continuous range equipment. The dyes are therefore applied by pad-jig or by all jig methods and intermediate drying is eliminated. The low-affinity dyes are padded and the high-affinity dyes are either jig dyed or padded at high speed at the highest permissible temperature.

Light Copen on 2,000 Yards—250 Lbs. of Sheer Linen 2 Rolls

Stabilized Leuco Anthraquinone Vat Blue	4.0 lbs.
Solvent	8.0 lbs.
Sodium nitrite	2.5 lbs.
Soda ash	0.25 lbs.

Made up to 32 gallons at 140° F.

The linen is dip padded through a 4 gallon padder trough thermostatically maintained at 140° F. The cloth is run at a speed of 150 yards per minute and batched. The wet rolls are then transferred to the jigs. Each jig contains 80 gallons of water at 120° F. containing 2 gallons of 168° Tw. sulfuric acid. An adjacent jig contains a copiously running flow of cold water. The padded cloth is passed through the first jig kept constantly at 120° F., and then without beaming up, into the second cold water jig where it is shelled up on the far beam in order to insure a constant cloth speed. The oxidation and soaping of the cloth is completed in the second jig by the following procedure:

End

1. Rinse in running cold water.
2. Run the cloth through a full jig of gently boiling water containing 3.0 lbs. of soap flakes, 5.0 lbs. of soda ash, and 4.0 lbs. of glucose.
3. Run back.
4. Rinse in boiling water.
5. Rinse in boiling water.
6. Shell up through cold water.

Notes

1. The leuco vat dye is pasted up with solvent at 160° F. and hot water is then added until solution is complete. A solvent is not absolutely necessary, but in routine production by the customary grade of mill labor it is helpful insurance against color specks.

2. The dissolved nitrite of soda and the soda ash is added to the padder feed tank at 140° F. and the dissolved dye is then added.

3. The soda ash counteracts the usual acidic atmosphere of the dyehouse, preventing premature selvedge oxidation.

4. The sensitivity of the anthraquinone vat blue to over-oxidization in the nitrite-sulfuric acid bath may result in a dull greenish cast. The use of glucose in the alkaline soap bath quickly converts the dye into the true, bright, reddish shade.

Maize on a 1,000 Yard Roll—150 Lbs. of Cambric Linen

The jig is prepared with 80 gallons of water at 75° F. containing:

Stabilized Leuco Vat Yellow.....	0.4 lb.
Solvent	1.0 lb.
Calcined Glauber's salt.....	10.0 lbs.
Soda ash	0.25 lb.

End

1. Run dry cloth through the above liquor.
2. Run back after adding 4.0 lbs. of sodium nitrite.
3. Run back after adding 2.0 lbs. of sodium nitrite and 5.0 lbs. of calcined Glauber's salt.

   Empty the jig and refill with 40 gallons of water at 140° F. containing 1 gallon of 168° Tw. sulfuric acid.
4. Run through acid bath.
5. Run back.
6. Rinse in running cold water.
7. Rinse in running cold water.
8. Run cloth through a full jig of gently boiling water containing 3.0 lbs. of soap flakes and 5.0 lbs. of soda ash.
9. Run back
10. Rinse in hot water.
11. Rinse in hot water.
12. Shell up through cold water.

Medium and dark shades are dyed with vat dyes except where the insoluble azo dyes are particularly applicable, or where the expense of dyeing a dark vat shade is too great and sulfur dyes must be used. A few of the most soluble and level dyeing vat colors can be jig dyed to produce a level, well penetrated dyeing, but in most cases the pad-pigment method is most suitable.

Pink on a 1,200 Yard Roll—150 Lbs. of Sheer Linen

The jig is prepared with 100 gallons of water at 120° F. containing:

Dry caustic soda.....	6.0 lbs.
Sodium hydrosulfite	4.0 lbs.
Dyeing assistant	1.0 lb.
Vat Red Violet RRK Paste.....	3.0 lbs.

The dry cloth is entered into the liquor and run as follows in a cooling bath:

End

1. Run dry cloth through dyebath.
2. Add 5.0 lbs. calcined Glauber's salt and 1.0 lb. hydrosulfite.
3. Add 10.0 lbs. calcined Glauber's salt and 1.0 lb. hydrosulfite.
4. Add 10.0 lbs. calcined Glauber's salt.

   Replace the dyebath with 30 gallons of cold water containing 2.0 lbs. of ammonium persulfate and 1 gallon of 56 per cent acetic acid.
5. Run cloth through the oxidizing bath.
6. Run back.
7. Run cloth through a full jig of boiling water containing 3.0 lbs. of soap flakes and 3.0 lbs. of soda ash.
8. Run back.
9. Rinse in hot water.
10. Rinse in hot water.
11. Shell up through cold water.

Notes

1. The dyes most suitable for jig dyeing linen are cold dyeing, very soluble vat colors. The dyeing of vat dyes at a very high temperature or at a boil will produce fairly level, well penetrated dyeing, but the procedure is too treacherous for routine production.

Royal Blue on 1,000 Yard Roll—150 Lbs. of Cambric Linen

Vat Blue BCS Double Paste.....	20.0 lbs.

Boil up to 22 gallons in the padder feed tank.

The padder tank is equipped with a slow speed agitator to keep the dye in uniform suspension without introducing excessive air or beating up foam. The roll of cloth is tenter framed before padding and is then dip padded at 60 yards per minute and batched. The wet roll is transferred to a

jig with 80 gallons of water at 120° F. containing:

12.0 lbs. of dry caustic soda
5.0 lbs. of sodium hydrosulfite
3.0 lbs. of soda ash
4.0 gallons—the residual dye from the padder

End

1. Enter padded cloth.
2. Add 1.0 lb. hydro and 1 pint of pine oil.
3. Add 1.0 lb. hydro and 1 pint of pine oil.
4. Add 1.0 lb. hydro.
5. Add 1.0 lb. hydro.
6. Add 1.0 lb. hydro.
7. Full jig of cold water containing 0.5 lb. hydro.
8. Full jig of cold water containing 0.5 lb. hydro.
9. 30 gallons of cold water containing 2.0 lbs. of ammonium persulfate and 1 gallon of 56 per cent acetic acid.
10. Run back.
11. Full jig of gently boiling water containing 3.0 lbs. of soap flakes, 3.0 lbs. of soda ash and 4.0 lbs. glucose.
12. Run back.
13. Run back.
14. Run back.
15. Rinse in boiling water.
16. Rinse in boiling water.
17. Shell up through cold water.

Notes

1. The addition of clear, not soluble pine oil, during dyeing prevents foam streaks from building up on the cloth and eliminates the possibility of the alkaline oxidation of the blue dye which would finally show up as dull greenish streaks.

2. Addition of hydrosulfite to the cold rinsing baths after dyeing keeps the dye well reduced while the excess of caustic is being removed, prevents streakiness from alkaline oxidation, and aids the fastness to crocking.

Azoic Red—Jig Dyed on a 1,200 Yard Roll—180 Lbs. of Cambric Linen

Solution of the Naphthol:

4.0 lbs. of beta hydroxynaphthoic acid beta naphthalide is pasted with
8.0 lbs. of solvent and
0.75 lbs. of dry caustic
2.0 gallons of water at 180° F. is added and the solution stirred until clear.

The jig is prepared with 80 gallons of water at 80° F. containing:

2.0 lbs. dry caustic soda.
1.0 lb. wetting-out agent.

The dissolved naphthol is then added.

End

1. Enter the dry cloth.
2. Run back.
3. Run back.
4. Run back.
5. Rinse in a full jig of cold water containing 20.0 lbs. of common salt.
6. Rinse in a full jig of cold water containing 20.0 lbs. of common salt.

Prepare the coupling bath as follows:

Paste up 15.0 lbs. of stabilized diazo salt with 0.5 lb. of dispersing agent and 2 gallons of water at 90° F. Immediately add 20 gallons cold water containing 3 quarts of 56 per cent acetic acid.

The jig is prepared with 30 gallons of cold water containing 10.0 lbs. of common salt, 5.0 lbs. of sodium acetate flakes, and 10 gallons of the diazo solution. The cloth is started through the coupling bath and the remaining 10 gallons of diazo solution are fed on during the first end. Three more ends are run, the final two from shell to shell in order to secure good penetration of the developer into the fiber. The succeeding ends are as follows:

End

1. Rinse in running cold water.
2. Rinse in running cold water.
3. Full jig of gently boiling water containing 6.0 lbs. of soap flakes, 3.0 lbs. of soda ash, and 0.5 lb. of synthetic detergent.
4. Run back.
5. Full jig of gently boiling water containing 1.0 lb. of synthetic detergent.
6. Run back.
7. Rinse in boiling water.
8. Rinse in boiling water.
9. Rinse in boiling water.
10. Shell up through cold water.

Loomstate dress linen, weighing about 4 oz. per yard requires a preliminary treatment to remove sizing materials, eliminate weaving stains, improve the whiteness of the ground, and to swell and soften the yarns. This is best done on over-reel dyebecks in the loose rope form.

If spotting with iodine solution shows the presence of starch, the fabric is desized with enzymes, preferably using those effective at high temperatures in order to secure the benefits of good penetration and accelerated rate of reaction. At 160° F., twenty minutes' treatment is adequate when using ¼ oz. of enzyme per gallon under correctly controlled pH conditions.

The better grade and fairly clean loomstate fabrics are boiled off for 1 to 2 hours in a solution containing per 1,000 gallons:

15.0 lbs. soap flakes
10.0 lbs. soda ash
4-8 gallons sodium hypochlorite (14 g. available chlorine per liter).

They are then rinsed in softened hot water, extracted, opened, dried, and framed for dyeing.

The lower grade loomstate linen fabrics may require an additional bleaching operation, especially if dark colored fiber and sprits appear when the mild scouring and bleaching operation just outlined has been completed and it has been found that the chief result was the removal of filling and whitening chemicals which gave the fabric a fictitious appearance of quality. Additional bleaching

may be performed with hydrogen peroxide or potassium permanganate.

If a peroxide bleach is used the bath is started cold with:

3-9 gallons of 100 vol. peroxide
1½-4½ gallons of sodium silicate

1,000 gallons.

The temperature is slowly raised to a boil and the operation terminated when all the oxygen is consumed.

If a permanganate bleach is used the bath is started cold with:

2-8 lbs. of potassium permanganate per 1,000 gal.

As soon as the permanganate is well distributed throughout the cloth there is added:

¼-1 gallon of 168° Tw. sulfuric acid.

The temperature is gradually raised to 160° F. and when all the violet coloration has been replaced with the brown manganese dioxide color the bath is dropped.

The brown color is removed by a fresh bath containing:

3-12 lbs. of sodium bisulfite or
4-16 quarts of 100 vol. peroxide
2- 8 quarts of 160° Tw. sulfuric acid.

After rinsing twice the fabric is ready for drying.

For the lowest price dress market a limited variety of pastel shades is dyed with direct dyes, selecting from this group those dyes combining the best light and wash fastness. To secure level, well penetrated shades the cloth is dip padded. To secure the best possible wash fastness, as well as to prevent two-sidedness during drying, the dyed rolls are taken from the padder to the jigs and given four ends in a boiling bath charged with 20 lbs. of common salt per 40 gallons. They are then shelled up through cold water containing 10 lbs. of common salt per 100 gallons.

Dark shades for the lowest price dress market are dyed with diazotized and developed dyes. Application of these dyes to this type of linen fabric is most successfully conducted on over-reel dyebecks. Jig dyeing does not produce as wash fast a result, the penetration is less satisfactory, warp streakiness often is apparent, and it is exceedingly difficult to secure satisfactory diazotization and development. The linen fiber under the tension of jig dyeing is quite resistant to the penetration of the cold diazotization and development baths, and often after the usual process has been completed it will be found that a large percentage of undeveloped dye is still present and may be easily washed off the fabric. On the other hand, the application of the diazotized and developed dyes on the dyebeck presents no unusual problems.

For example:

1,200 yards—300 lbs. of linen, shade: wine

Diazo Bordeaux 2BL.....	12.0 lbs.
Diazo Red 7BL	2.0 lbs.
Soluble pine oil.....	1.0 gallon

800.0 gallons

The dissolved dye is added to the lukewarm dyebath and the temperature gradually raised to the boil. After 20 minutes at the boil, 50 lbs. of calcined Glauber's salt is added. At the end of a further 20 minutes, 50 lbs. more of salt is added. After a further 20 minutes the dyebath is drained and the cloth is washed in cold water. Diazotization then proceeds for 30 minutes in a fresh cold bath containing per 800 gallons:

10.0 lbs. sodium nitrite
25.0 lbs. hydrochloric acid

The diazotizing bath is then drained and the cloth is twice washed 10 minutes in cold water.

Development proceeds for 30 minutes in a fresh cold bath containing per 800 gallons:

3.0 lbs. beta naphthol
3.0 lbs. caustic soda flakes

The development bath is drained and the cloth is washed 20 minutes in cold water.

A light soaping follows to remove any uncombined naphthol and loose color. This requires 20 minutes in a bath at 140° F. containing per 800 gallons:

8.0 lbs. of soap flakes.

After a thorough rinsing in softened water at 140° F., the cloth is rinsed again in cold water and is then ready for drying.

The higher quality dress linens for the more expensive garments are dyed with fast colors; employing vat, naphthol and sulfur dyes. To secure the best penetrated and most level dyeings it is beneficial to enhance the absorbency of the fabric by drying in a wetting-out agent before dyeing. This pre-treatment is far more efficacious than the addition of wetting-out agents to the dyebath. The cloth is padded with from 1 oz. to 3 oz. of a wetting-out agent per gallon, dried in the roller hot flue or on the cans, and framed for dyeing. If the cloth is not pretreated in this manner then it is essential to use the most highly dispersed colloidal dyes, and it may be helpful to add a penetration assistant to the padding liquor, choosing one which is not incompatible with the particular type of dispersed dyes which are used.

Example I—Pre-Treated Cloth

1,200 Yards—300 Lbs.—2 rolls of 4 oz. Dress Linen

Shade: Turquoise

The cloth is pre-treated with 50 oz. of a wetting-out agent dissolved in 36 gallons of water, padding at 120° F. and drying in the roller hot flue.

The tenter framed rolls are then padded at 100 yards per minute through the following liquor:

12.0 lbs. Jade Green Single Paste
1.0 lb. Blue BCS Double Paste

35.0 gallons

The wet rolls are transferred to the jigs. Each jig is prepared as follows:

2.0 gallons caustic soda 70° Tw.
6.0 lbs. hydrosulfite
2.0 gallons pad liquor (½ of the residue from padding)

80.0 gallons at 120° F.

(Continued on page 727)

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

DECEMBER 11, 1939

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Members should notify the **Secretary** immediately of all address changes

• CALENDAR • OF COMING EVENTS

Meeting, Philadelphia Textile School Student Section, December 14, 1939.

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., January 26, 1940.

Annual Meeting and Convention, auspices New York Section, October 18th and 19th, Hotel Commodore, New York City.

PAUL KRAIS

IT is with sadness that we report the death of Dr. Paul Krais, for many years an active member of the American Association of Textile Chemists and Colorists. He has served as a valuable member of our committee on light fastness and was always cordial, cooperative, and helpful in our efforts to establish international standards for color fastness to light. In the death of Dr. Krais the Association has lost a valuable member, and the committee on light fastness will miss his wise counsel. The Association extends to Mrs. Krais its sincere sympathy in her bereavement.

The Management and Operation of a Hosiery Dye House*

A. G. ALEXANDER† and CLARENCE WILLE**

A. ARRANGEMENT

1. Machines

WE will try to visualize for you the setup of a theoretically perfect hosiery dye house, and our remarks must be accepted in that light. Hence if any of our ideas seem too radical, please remember their conception.

It has been customary since the start of hosiery dyeing to locate machines as near the source of ventilation as possible, and while all mills do not have the advantage of an up-to-date ventilating or air conditioning system, we must assume that this condition exists in order to properly arrange the dye plant for efficient operation. Good ventilation is of prime importance in a dye house and all modern plants are constructed with this in mind. The poorly ventilated dye house is usually foggy, causing accidents due to poor visibility and also presents a health hazard because of excessive humidity. Condensation causes deterioration of equipment and may cause considerable electrical trouble. It also causes much damage to the dyed product.

The question now arises as to machine size. If all machines are of the same capacity, the problem is much simplified, but when a condition exists where there are machines of more than one size, which usually is the case, we then have our first complication.

In general, it has been found that straight line methods are best, that is, all machines which are the same size are grouped in a row, with the supply of grey goods feeding in at one end and the extractors for the finished goods at the other.

Unfortunately, this condition does not always exist, and while a program of re-arrangement is sometimes expensive, it will be found that it will pay dividends in the end.

Another factor to be considered is the future expansion of the dye house. In arranging machines, it is good practice to remember that some day machines may be added, and provision should be made to allow these to be located with the group where they belong. If this is not kept in mind, it will not be long before the dye house will be a hodge-podge.

2. Auxiliary Equipment

a. Weighing or Drug Room

In considering auxiliary equipment, there are again several factors to think of. First, the location of the all important weighing room, or drug room as some call it. The term "drug room" is misleading in that it infers that both dyestuffs and chemicals are stored and weighed in one spot. We like to think differently and separate the dyestuffs from the chemicals, and in doing so, eliminate one danger of complicating our problem by having the weigher confine his attention solely to dyestuffs.

The weighing room should be so located that it is readily accessible to both the machines and the source of supply. This can be accomplished by building a service door at the rear of the room, and when we say rear, we mean the side farthest from the machines, and building a door similar to a Serv-i-dor, such as you see in hotel rooms, in the side nearest the dyeing machines. This will allow for deliveries of dyestuffs in large quantities at the rear door, and such deliveries will not interfere with the smooth flow of production when weighed lots of dyestuff are being given to operators at the front door.

The object of using Serv-i-dor construction, which is really an air lock, is to avoid flying dyestuff, with its complications which we all know.

b. Extractors and Dryers

The matter of location of extractors is of great importance, if the principle of straight line production is to be followed. It is again necessary to remember to locate the extractors at the opposite ends of the machine rows so that the work may flow from the grey stock, through the machines, thence to the extractors. It should be remembered that finished work from extractors should flow with the least possible resistance to the boarding room, this being the last step in handling in the dye house.

Some plants finish their goods in other machines than those used for dyeing and this, of course, calls for special arrangement of the finishing machines and extractors. Straight line production methods can be used here also and the work routed in the same manner as in dyeing.

B. DYEING EQUIPMENT

1. Construction

When hosiery was first dyed in rotary machines, both

*Presented at a meeting of the Mid-West Section, Oct. 21, 1939.
†Head Dyer of the Phoenix Hosiery Co., Milwaukee, Wis.
**Burson Knitting Mills, Rockford, Ill.

the drums and outer cylinders of the machines were built of wood. This, as we know today, was primitive, but the best that could be had at the time. It presented the great difficulty of having to strip machines between every lot, and even then, the absorption by the wood was so great that many times the color from a preceding lot came out of the wood and attached itself to the lot being dyed, with the usual difficulty for the dyer. Then Monel came into the picture. Here was a metal which would resist penetration of the dye, and would allow a quick change from one color to another without stripping, and also would not corrode. It was the greatest improvement that had come to the dyers' attention for a long time. It still ranks highly today among the best metals for textile processing. Then followed stainless steel. This, without a doubt ranks with the best. True, there are still some problems to be worked out in its fabrication and application, but from our experience with it, there is little left to be desired. One thing that many mechanical engineers do not remember is the fact that when two unlike metals are placed in contact with each other in an electrolyte, a simple electric cell is formed, and corrosion or electrolysis occurs much faster than if the metal were all of one kind. We refer specifically in this case to the use of brass gears and bronze bearings in contact with Monel or stainless in a dyebath which, of course, is the electrolyte, and in some cases a very strong one. It could be, therefore, concluded that today, Monel or stainless, with the one exception we have made in regard to construction, are the ideal metals for hosiery dyeing machines.

2. Speed

It is generally recognized in the dyeing of hosiery, particularly silk, that chafing or roughing plays an important part. This is controllable in the speed of the drums. Usually that speed with which good penetration can be had without running too fast is the most desirable. This will vary with different sized machines, and generally, the smaller the machine the higher the speed necessary to obtain a good job. In specifying silk, we do not mean that chafing is confined to silk alone. It has been known for some time that cotton and sometimes even rayon hose will chafe if run too long or at too high a speed.

3. Number of Pockets in Machines

Recently the question has been brought up as to which is best, the 3 or 4 pocket type machine. There is room for much discussion on this score, but the general consensus is that a 4 pocket machine present much more flexibility to the dyer. This is particularly true when the dyer is confronted with the problem of short weight loads. It has always been found best to divide a short weight load into 3 of the 4 pockets, rather than try to divide into 2 of the 3 pockets as is the case in a 3 pocket machine. It is our experience that it is easier to obtain penetration in the ordinary four pocket type than in the three pocket type. We also find that on wool hosiery there is less shrinkage in the three than four pocket type.

4. Loads as Rated

In manufacturing dyeing machines, the manufacturers specify a given load for each type of machine. This may or may not be based on past experience, but long experimentation in our mill has shown that a machine may be safely overloaded 25 per cent above its rated capacity, but when the overload is increased to 35 per cent, uneven work results. This naturally means more production in a given number of machines, and what with present labor rates at high levels, the dyer has a tool to work with to enable him to cut down his costs. It has also been found that penetration is far better on full or rated loads than when we decrease the size of the load considerably (say 30 per cent).

5. Inlets and Steam Lines

Recently one of the dyeing machine companies has stressed in their advertising the fact that the machines they build have the inlets on the bottom, and try to show that certain advantages can be had by so building the machines. While this practice is not new, it really does have an advantage in that the water is fed into the machine from the bottom, and any excess must naturally go out over the top, thereby creating a flow from bottom to top and washing out any dirt or foreign matter from the goods being dyed. This practice has been done in some mills for quite a long time with good results.

Another factor in good dyeing is the manner in which the steam is run into the machines. It has been found best that if two steam lines are used, that if one is run into the machine from one end, and the other is run into the machine from the other, a much evener boil results which, of course, reflects in the dyeing.

6. Comparison of Paddle and Rotary Machine

There are two types of equipment used for general hosiery dyeing, the paddle machine and the rotary machine.

The plain paddle wheel type is the oldest machine used for hosiery dyeing. All kinds of material can be dyed in it, but it is exceptionally useful for processing wool and worsted hosiery. However, by far the greatest percentage of hosiery produced is dyed in rotary machines.

It might be worth while to compare the two types of machinery in a general way and give the advantages of each. The paddle type is of course far more simple than the rotary type both from a mechanical and electrical view-point. This is the one advantage it has in general hosiery dyeing over the rotary.

For machines of the same rated capacity the paddle requires more floor space. It is not nearly as flexible as the rotary and far more difficult to vary load size without running into considerable trouble. Penetration, too, is more difficult to obtain in the paddle than in the rotary.

Due to a longer bath and the fact that it is not covered like a rotary, it is far less economical to run.

However, for wool and worsted dyeing, especially light weight hosiery, the paddle type is far better than the other. Due to the fact that the hosiery floats in this type of machine, there is less mechanical agitation and as a result far less danger of matting and felting.

C. METHOD OF DYEING SILK HOSIERY

1. Double Bath

When silk hosiery was first dyed, it was thought that the double bath method was the last word. While this method still has its advantages, the cost of handling makes it prohibitive. The double bath method consists of degumming the goods completely and then rinsing. Then the goods are entered into the dyebath (after having been well shaken out) and dyed. One advantage claimed for this process is that better control can be exercised over the colors with more uniform repetition of shades. This may or may not be true. In our experience, it has been apparent that the double bath method, while it may give better repetition of shades, leads to unevenness which, of course, is a factor no one cares to contend with. The addition of dispersing and protective products will help overcome chafing and unevenness to some extent. It has been found, in analyzing this process, that an extremely low pH range holds forth during the second or dye-bath. This may be responsible for the lack of level dyeing, because in the majority of cases a low pH range allows the silk colors to snap on to the fabric very quickly with uneven dyeings as the result.

2. Single Bath

After the double bath method had been worked for some years, products were developed which allowed the dyer to do his degumming and dyeing in a single bath. This allowed remarkable savings in time and labor, but here again, disadvantages presented themselves. The single bath method was quite unlike the double bath in that its pH range was high. In some cases, too high for safe processing of silk, and while even dyeing was usually assured, the factor of chafing and overworking the silk became apparent. This is all in reference to the products which were available at the time when this dyeing method was introduced. Today there are products which will give a quick drop in pH so that the actual dyeing may be carried out at a low level, and coupling this with other refinements, such as protective materials, we find that we have come a long way from the first days of single bath processing. One drawback still remains, however, and that is the lack of control of shades to insure repetition from one batch to another. This is one of the inherent defects of the single bath method, and looking at the picture today, it would appear that this difficulty will never be overcome.

3. Split Bath Method

The split bath method represents a happy medium between the single and the double bath methods and in our opinion is the best development so far in the hosiery dyer's art. Here we have a first bath in which the so-called "A" fraction of the gum is removed and then the bath is dropped and a new bath is started in which dyestuff and some degumming agent, not as much as the first split or bath had, but enough to remove the remaining quantity of gum on the hose. The presence of this material is responsible for a pH range of about 8.5 to 9.5 in the second split, and it has been found that this range is ideal for level dyeing. Another factor is the original theory of split bath dyeing. It was found that the "A" fraction of sericin had no affinity for dyestuff, while the "B" fraction had a very great affinity for dyestuff while in an undissolved state. The practical application is this: First, the "A" fraction is removed and the bath thrown away. Second, a new bath is started with dye which immediately goes onto the "B" sericin. When this "B" sericin is dissolved or dispersed it loses its affinity for the dyestuff, and gradually releases the dye which in turn gradually goes on the fiber. It is this which insures the evenness of the dyeing and produces excellent results. The split bath method, with local modifications, is generally used today in most hosiery dye houses, and its results are most gratifying.

D. METHODS FOR MERCERIZED HOSIERY

Mercerized hosiery can be dyed in two ways: the one bath method, that is, scouring and dyeing in one operation and the two bath, scouring first and then dyeing. In the one bath method the following difficulty has been observed. Research has shown that the natural gums in cotton have powerful reduction action destroying color to a sufficient extent to make this type of processing impractical.

We have found, however, that we obtain more level dyeings (especially in light and medium shades) by scouring first and then dyeing. The two bath method seems far more conducive to getting even results when dyeing hosiery knit from unevenly mercerized yarns. Tiger stripes resulting from poor mercerization cannot be entirely eliminated but experience has shown us that a scour before dyeing plus a good selection of dyestuffs helps cover them to quite an extent.

E. METHODS FOR WOOL HOSIERY

1 and 2. Single and Double Bath

The dyeing of women's wool and wool and silk combination hosiery presents problems that are not met with in silk and cotton hosiery. Wool and worsted hosiery contains considerable oil when it reaches the dye house. This may be animal, vegetable or mineral oil in some form and must be removed from the fiber.

This type of hosiery shrinks very readily and must be

carefully handled to prevent matting and felting action.

It has been suggested that wool hosiery be run in a single scouring and dyeing operation.

This method possibly can be utilized when working with clean wool containing easily saponifiable oils, but so frequently the oils used are removed with great difficulty that the two bath method seems the only logical way of processing hosiery of this kind. Give the material a good scour—not over 120° F. and then rinse carefully. In this way all possibility of uneven dyeing due to oil spots will be eliminated and far clearer and faster shades will result.

The problem of preventing fulling and with it shrinkage is one which has given considerable trouble to the wool hosiery dyer. It seems that dyeing equipment is the answer to it. We have dyed worsted, worsted and silk and worsted and rayon combinations in different types of dyeing machinery and have found that the paddle wheel gives best results. The Dri-Sol process has aided greatly in the correction of this difficulty.

In the rotary wheel (run at speeds which give admirable results on silk hosiery) wool hosiery is forced through the dye bath, sliding and pounding against the drum as it rotates. This causes fulling action.

In the paddle, the hosiery floats and as a result receives far less pounding action than in the rotary. If only rotary equipment is available, care must be taken not to run wool hosiery too long. It is possible, however, to prevent shrinkage in a rotary to some extent by cutting down the revolutions of the cylinder. Care then must be taken to use good leveling and penetrating agents as poor penetration may result otherwise.

F. TYPES OF GOODS

1

When hosiery was first dyed it was dyed loose and this meant great losses in tearing and pulling. Some method was sought to protect the fabrics and the answer was bags. At first, nets were used, but they had drawbacks such as harsh strings which snagged the hose and openings between the meshes which allowed the hose to come in contact with the drums of the machine. This problem was solved by using cheesecloth bags which allowed the dye to penetrate but protected the goods in a much better manner than the nets. Today most hosiery plants use the cheesecloth bags. The quantities with which each bag is loaded will vary according to style, and there again you have a problem which is local to your mill. One of the factors which has had a bearing on the handling of silk hosiery in the dyeing operation has been the fact that the trend in recent years has been toward lighter weights. Shortly after the World War, the common weight hose was ten, twelve or even fourteen thread and this has gradually decreased until today the majority of our work is two, three and four thread hose. Naturally this means that greater care must be taken in handling the hose and in protecting them against the dangers of injury while they are in process. This development has been largely responsible for the changes which have taken place in recent years.

2

Some types of goods are still dyed loose, but they are few and far between. It is advantageous in some cases, where a problem of penetration exists, to dye loose, if the construction of the hose is such that they can stand the punishment, but it is a good rule that wherever possible to dye all goods in bags.

G. WATER SUPPLY

When the present day water softening materials were not available, it was customary to attempt to produce a proper conditioned water in the machines by the addition of certain materials which had softening ability. But this practice was only makeshift at its best, and with the advent of commercial water softening equipment, such as the "Zeolite" system and others, it became possible to produce softened water in quantities at a low cost. This was a great improvement for the dyers, but it was not the entire answer to the water problem, for while the water was soft, it had other characteristics which had to be corrected. One of these difficulties was suspended matter, and this problem was solved through the use of filter beds, either in the plant itself or in the water supply at its source. Most modern water supply systems today employ coagulating systems and filter systems together, and produce a comparatively high quality of water when fed through a softener at the plant. Another difficulty encountered was excess alkalinity, or a great variation of alkalinity, this being more prominent where water is drawn from rivers, and today we have automatic apparatus to control the pH of water before the dyer uses it. This has proven to be a great help to uniform results. We are using Lake Michigan water which is from 7° to 8° in hardness and is quite easily softened with comparatively small amounts of carbonates and bi-carbonates of soda present. However, in water as hard as that at Fort Wayne or at Rockford the alkalinity of a Zeolite softened water is quite high. Fort Wayne, of course, neutralizes its alkalinity. Rockford has an ideal set up. They use a lime soda system softening to a very low degree of hardness, coagulating and running off their sludge. They then soften by means of a Zeolite system and have a water which is not only soft but has a very low amount of bi-carbonates present. It is probably slightly more costly to do it in this way, but it certainly results in almost perfect water for dyeing purposes. One of the greatest dangers to the dyer in the use of a softener is the tendency to run the softener too long between recharges. This can be prevented by the use of proper methods of checking the finished water. The use of soap solution will give accurate results, but for proper control, the soap should be measured in a burette in order to obtain the greatest accuracy. The drop system is satis-

factory for a mere check, but it does not indicate the condition of the softening bed with sufficient accuracy. Every plant has its own water problems because of the variations of the source of the water. In our case, although we have a great supply of comparatively uniform water in Lake Michigan, it too needs attention at times. But we know that our troubles do not being to compare with those of a plant which draws its water from a river or other source where every day or every rainstorm brings a new type of water to be treated.

H. MATERIALS AND PURCHASES

1. Dyestuffs

All dye plants today are run on a basis of cost. In some cases this cost is rendered in cost per pound or cost per dozen, and in other cases in an over-all figure with no relation to cost per pound or dozen, but to a total production. Whichever method is used, the result is the same and the responsibility rests with the dyer to run his plant at its utmost efficiency. This can be controlled to some degree in the purchase of dyestuffs. Here you have a question which can cause no end of grief. With all the prototypes which are on the market today, the dyer finds sometimes three or four colors which can be used interchangeably with the same results. Sometimes the shades will be identical, but the fastness qualities will not be the same. Here the use of testing equipment will prove invaluable. We do not mean that it is necessary to buy expensive equipment, but the intelligent use of our handbook will help any man find the product best suited to his purpose. Let us take for example the matter of light testing. A "Fade-O-Meter," of course, is the last word in testing for light fastness, but what is there to stop a dyer from building a cabinet in which he can mount samples to be tested and have this cabinet mounted on the roof of his plant? The only objection is the time element, and in most cases that is not so important. The matter of wash fastness can be taken care of easily and the factors entering into tests of this type must be adjusted to the needs of the plant. All of these things have a direct bearing on the purchases of dyestuffs, and after careful investigation, a dyer finds himself with two or more products of the same type and quality, then he can think in terms of price and govern himself accordingly. This is true in the cases of almost all dyestuffs, but when you have variations in strength, then great care must be taken not to be misled by a low price. We have found in recent years that one particular dyestuff which we are using, while it is higher in price than its so-called prototypes, still is cheaper to use because it has so much more strength than any of the competitive dyes.

2. Chemicals and Assistants

The matter of heavy chemicals for a dyer is not so important from a standpoint of price, because in most cases the prices are pretty well standardized. Once a man has a product which has stood up under a careful investigation for strength and purity, he will usually find that that same quality sells for the same price at all sources. But not so in the field of assistants and specialties. Here the unwary will find himself buying an inferior product at a superior price, and we must stress the necessity of great care in testing and selecting these products. There are certain products which have undeniable qualities, and the problem of the dyer is to separate these from the ones which are made up of dilutions of the originals. Here again the necessity for careful testing becomes apparent, and we have found, as a general rule, that once a product has been tested and approved, it is best to stick with it with, of course, an eye to any new developments which may come along. Do not change materials without being sure that a new product has more advantages than an old one.

One fact has been brought out by the men who represent suppliers, and I think they will bear me out in this statement, that they are not always given an even break in the nature of interviews and reports. It is only fair to expect a report if a supplier has submitted a sample, and if a manufacturer has been willing to invest his time and money in the submission of samples, he has a right to expect a report. Such work can be easily taken care of by accepting only such samples as are requested and rendering a report on the same. It must be kept in mind that the dyer is isolated in his own particular mill and can greatly benefit by his interviews with the men who get around to all the men. This naturally means that a certain time should be granted for interviews and such time spent usually more than pays for itself.

I. STEAM AND POWER SUPPLY

Ever since the beginning of the modern method of dyeing, steam has been used as the heating medium for dyebaths, and where it is used in closed coils, it cannot cause much difficulty other than a variation in heat units which will, of course, slow up the operation. This difficulty is seldom encountered unless the dyer has to fire the boiler himself which is rather remote. Where steam is used directly into the dyebath it can cause no end of trouble if it is not properly checked. The above mentioned question of heat units in this case is of vital importance because dilution of the bath will raise havoc with dyeings when the steam contains too much water. This condition is sometimes found when dye plants start up after a shutdown and the heat of the steam is dissipated in cold pipes and machines. This can be corrected by suitable preheating and allowing the steam to blow through the lines before using them for actual dyeing operations. Another factor is pressure. Engineers sometimes find themselves with a large supply of exhaust steam which they do not like to waste and they have at times tried to work out some method of re-heating this steam to make it usable in dyeing. This, to our experience, has not worked out very well because low pressure steam does not produce the results of good, high pressure, live steam. The third

possibility of trouble from steam is that of foreign matter. Oil, boiler compounds and the like, which get into steam at various points before the arrival at the dye plant, will cause no end of difficulty for the dyer. Many large dye plants now install separators on the steam main in the dye plant, and in doing so remove any foreign matter from the steam before it gets into the dye baths. This has been a great help and we can highly recommend it.

The matter of power supply is of vital importance, and while failures of this type are rather remote, a regular check of all equipment which is connected in any way to the power supply will pay dividends. It is a rather discouraging sight to see all the machines in a dye plant stop while the dyeing operations are going on, and we, having once witnessed this, do not wish to see it again for a long time.

J. CONTROLLING AND RECORDING APPARATUS

For about the last fifteen years, various attempts have been made to build an instrument which will control the temperature of a dyebath. The best instrument to our belief which has been brought out for the dyer is the recording thermometer. Here we have no complicated mechanism to get out of order, and with electric clocks they do not even require winding. The advantage of a recording thermometer is the fact that it gives the dyer both a check on the temperature range of a dye bath, and the time element is very plainly traced on the chart. The dyer may, at any time, check back and assure himself that processes are being carried out according to his wishes. Another fact in favor of thermometers is the matter of cost. Two or three thermometers can be had for the cost of one recorder, so a plant may be completely equipped at much less cost and in a shorter time. All dyers will not agree to these statements, but they are the result of our experience, so they must be taken for what they are worth.

K. A DYER'S EDUCATION

Here is one of the most discussed questions in recent years. Should a dyer be a high powered scientist? Should he be a college graduate? Should he be a man with a wealth of practical experience and get his academic education the hard way? There is room for argument on all sides. We have seen cases where men with the finest education could not absorb the principles of actual practice. On the other hand, let us try to visualize what the qualifications of the ideal dyer would be.

First, he is working in a chemical industry, or rather one which is based on chemistry. So he should have a good working knowledge of general chemistry, he should be able to run analyses, qualitative and quantitative, and his education should allow him to readily absorb any new development which might take place in the industry. Second, he should have an open mind, both from the standpoint of methods and materials, but also from the standpoint of separating theory from practice. One of the greatest evils in education today is the fact that too much theory overweighs not enough practice. Third, he should be somewhat of an engineer so that when the matter of layouts comes up he may readily understand what it is all about, and also that he might take machine specifications and compare them intelligently so that he, as well as his organization, may benefit from wise choices of equipment.

Fourth, he should be somewhat of a diplomat, for a dyer today must not only sell himself and his work to his management, but he must also sell himself to the men who work under him. Not that he should be soft or weak, but cooperation can go a much longer way than friction. With the labor situation in the upset state that it is today, a dyer needs all the help he can get, for regardless whether he is a dyer or the head of any department, he is open to criticism which in the older days was unknown. It might be added that much of the labor troubles today are little petty things which in other years would never have been known to exist.

Fifth, the practical dyer will get more education from his contacts with his fellow dyers than he ever could get from schooling or text-books. It is definitely to his advantage to continue his education by maintaining a continuous membership in an organization, such as this, where the interchange of ideas will always be beneficial.

This is where our organization comes into the picture. By holding meetings at which papers are given which are of interest to the entire group; by holding meetings, such as this, where the spirit of discussion is not suppressed and by the contacts with men in the same organization at such times as meetings are being held, it is possible to greatly extend the knowledge of the work at hand. The fact remains that dyeing cannot be learned from a textbook and that the experiences of older men can always prove beneficial to a young man just starting in the profession.

MEETING, PHILADELPHIA TEXTILE SCHOOL STUDENT SECTION

THE first Fall meeting of the Philadelphia Textile School student section was held November 26.

Professor Bertolet explained the organization and work of the A.A.T.C.C. to the first year men who were invited to attend the meeting.

A new treasurer, Thomas Key, was elected and a sectional representative from the first year, Joseph Dunson.

Frederick Jones and Henry J. Rotters, two members of the third year chemistry and dyeing class, told of their experiences during the past summer at the Ciba Company's school. Howard Gerry, who has spent two summers at Ciba's school, added a few remarks.

The next meeting will be held December 14.

Respectfully submitted,

RUTH CHARTENER, *Secretary.*

1939 versus 1914*

W. F. Van RIPER**

WHILE such a subject could easily be amplified into an interesting three or four-hour talk, if I were to attempt to cover the hundreds of new products we take almost for granted these days, I have decided against such a breach of friendship. A much more interesting way for you to cover all of them would be to attend the New York World's Fair. Hence, I have decided to make my remarks tonight rather brief in that I will confine them to the underlying conditions in this country involving the chemical and associated industries which I believe have brought about most of these new developments.

When you take the time to recount just a few of the many scientific blessings which the last twenty-five years have brought us, you are rather amazed and you find yourself wondering how and why they have come to be. But it does not take long to reach the conclusion that scientists in the person of chemists, physicists, metallurgists, pathologists and many others, are those really responsible for these new discoveries.

You then ask yourself, where have all of these revolutionary ideas been conceived. You have the answer, however, almost as soon as you raise the question. It has been in the research laboratories of industry and in the scores of relativley new, wonderfully equipped university laboratories.

Then it is that you realize that even these laboratories, to a great extent, have become our priceless possessions since 1914. Of all of them, I think the chemical laboratories of our universities stand out in high relief, for they are the supply wells from which industry is constantly drawing its urgently needed chemists.

The important position that chemistry now enjoys in American university curricula is quite different from that which it was given prior to the last war. To be sure, they had small chemical laboratories and splendid chemistry professors in those days, but most of the graduates had to find employment in the heavy-chemical industries. Every graduate had had his year of organic chemistry, but there were so few opportunities for employment in this field, that the pleasure they had experienced in producing laboratory quantities of Crystal Violet or Victoria Green was soon forgotten.

In those ancient days of 1914, there were seven relatively small dyestuff plants in this country of ours producing about three and one-half million dollars worth of dyestuffs per year, but all of the complicated chemical reactions involved in the production of the dye intermediates had been previously carried out in the plants abroad, so that only the relatively simple task of combining them in American plants was necessary. Some five hundred twenty-eight persons were employed in these plants, which latter represented about a three million dollar investment.

Then, as we all know, and used to sing, "came the war," and the American textile industry, the medical profession, the photographic industry, and scores of others, became acutely aware of the fact that the most essential of their raw materials had been secured from abroad, which sources of supply had just been abruptly cut off.

Many of us recall the frantic months that were experienced then, some manufacturers being bolstered up by the false hope that the war would be of short duration. Some of you remember only too well the prices that were paid for the remnants of earlier dyestuff importations.

Fortunately there were some chemical manufacturers who decided to gamble on the possible duration of the war, and so laid the foundations of our present dyestuff and synthetic organic chemical industry. It was not long before these hastily constructed plants were turning out increasing amounts of the less complex colors.

It immediately became apparent, however, that while it was a compartitvely simple matter to set up chemical equipment, the real task was to find the trained organic chemists to supervise their operation. As a result, it took many months of trial and error with the complicated organic chemical reactions necessary in dyestuff manufacture to develop this first crop of American chemical engineers.

Then it was that the professors and instructors in the laboratories of our universities accepted the challenge and settled down to the joyous task of training and supplying to industry these sorely-needed chemical engineers. At the present time, practically every plant that is dependent to even the slightest degree on the use or development of chemical products has one or more of them on their staff.

Soon it was that we had almost an epidemic of new chemical laboratory dedications in our universities. I recall in particular one of them at New Haven, Conn., in April 1923, and I remember especially a piece of insti-

*Presented at meeting, Piedmont Section, Oct. 7, 1939.

**District Sales Mgr., Dyestuff Division, E. I. du Pont de Nemours & Co.

tutional advertising on the part of one of our large chemical companies which appeared in the Yale University News on the occasion of the dedication of their new $3,000,000 Sterling Chemical Laboratory. The advertisment was captioned "Quo Vadis," which they tell me could be liberally translated as "Which way are you going," and under this heading was given some observations made by Louis Pasteur back in 1888, during the year he discovered a cure for hydrophobia, but in a time, as at present, when wars were quite popular.

The quotation read:

> "Two opposing laws seem to me now in contest. The one,—a law of blood and death, opening out each day new modes of destruction,—forces nations to be always ready for the battle. The other,—a law of peace, work, and health, whose only aim is to deliver man from the calamities which beset him. The one seeks violent conquest; the other the relief of mankind. The one sacrifices hundreds of thousands of lives to the ambition of a single individual; the other places a single life above all victories.
>
> "* * * Which of these two laws will prevail, God only knows. But of this we may be sure, that science, in obeying the law of humanity, will always labor to enlarge the frontier of life."

Judging from the many new blessings added to our everyday life, which have come out of the chemical laboratories of our colleges and plants, I believe it can be truthfully stated that the American chemist has lived up to the highest ideals of his profession, and that he has been able in many ways "to deliver man from the calamities which beset him." There are literally thousands of them "laboring to enlarge the frontier of life," about whom we shall never hear, nor would they have it otherwise.

Summarizing, it might be interesting to review briefly how far we have gone on the road toward national chemical self-sufficiency. I know you will pardon me, and possibly thank me, if I do not attempt to cover all branches of the industry. Inasmuch as the present day extent of development in any one group would be approximately duplicated in the others, I will only high-spot the dyestuff industry.

Instead of only seven small plants producing dyestuffs, we now have over forty, with nearly two hundred fifty plants in the entire synthetic organic chemical industry. Instead of five hundred twenty-eight employees producing dyes, we now have thousands, with the highest percentage of technically-trained men in any industry. Upwards of five million dollars is spent each year in research.

More than six billion dollars worth of merchandise have their desired sales appeal because of these American-made dyestuffs, and yet only about $60,000,000 worth of dyestuff per year brings all of this about.

It is easy to understand therefore why a few present-day consumers imagined a few weeks ago that they should get ready for a repetition of 1914 conditions, when England advised Germany last month that a state of war again existed between their two countries. These unthinking individuals were afraid that under any blockade laid down by England their necessary supplies of dyes would again be cut off.

Needless to say, they did not know, or had forgotten, that the American dyestuff industry has been taking care of over 95 per cent of their total dyestuff needs for many years. As a matter of fact, dyestuff importations in 1938 totaled only a little over 3,000,000 pounds. If the industry was able to produce more than 122,000,000 pounds of dyestuff in the peak year of 1937, surely there should be no need for fears as to a continued sufficient supply. This large total covered some 1,200 separate and distinct types of dyestuffs, each with its own peculiar dyeing and fastness properties.

In order to produce this large total of dyestuffs in 1937, and to supply the essential raw materials for the increasing requirements of various types of synthetic resins, and for other uses, a production of more than 575,000,000 pounds of coal-tar intermediates was necessary. Included in this total were more than 65,500,000 pounds of phenol and slightly over 45,000,000 pounds of phthalic anhydride. There were approximately five hundred eighty other intermediates necessary.

So as to give you an idea of the size of some of the off-shoots of the dyestuff industry, it might be of interest to know that during the same year 14,000,000 pounds of coal-tar medicinals were produced, valued at more than $11,000,000. Five million pounds of this total represented the sales of aspirin.

We have all heard about the recent discovery of the effectiveness of sulfanilamide in combating streptococcus infections. In this connection, the production in 1938 of this old dyestuff intermediate, which recently has been elevated to the status of a medicinal, exceeded that of 1937 with a surprising total of 374,000 pounds.

In 1937, more than 4,000,000 pounds of synthetic coal-tar flavoring and perfumes materials were produced.

Synthetic resins of all types in 1937 reached the remarkable total of 160,000,000 pounds, with rubber chemicals of coal-tar derivation totaling some 29,000,000 pounds.

Coming back to dyestuffs again, to consider for a moment the comparatively small importations which have been necessary to satisfy the needs of our consuming industries, statistics show that while the total was a little more than 3,000,000 pounds; they were made up of about 2,000 types representing either patented colors, which could not be made here, or those which had certain specialized uses, the total requirements of which in this country were so small as to make their economic production here impossible.

As most of you realize it has only been possible to develop an American dyestuff industry by giving it tariff protection, made necessary to cover the differences between labor costs here and abroad. Before Congress was willing to foster this new industry to such an extent, it was

necessary to secure the support of the leaders in the textile industry. Fortunately there were many of them who keenly appreciated the fact that they needed a dyestuff industry of their own so as to eliminate for all time a repetition of their 1914-1916 scarcity of dyes. The wisdom of their action then is now apparent. 1939 finds them with a strong right arm in the form of a willing and able dyestuff industry which will do everything in its power to satisfy their color needs. Dyestuff consumers will also find that the color manufacturers will not be taking advantage of the present speculative market, in that they fully appreciate the responsibility of their position and are keenly aware of the fact that it was the textile industry which made their existence possible.

With the present war cutting off practically all exportations of dyestuffs from Europe, the rest of the world is now turning to the United States for its dyes, with the result that we are being deluged with orders from all over the world. While we sympathize with these countries over the predicament in which they find themselves, we feel that our first obligation is to domestic consumers. Their requirements will be completely satisfied before any possible surpluses are available for export.

The last World War brought us the loss of loved ones and saddled us with tremendous debts of our own and others. It did, however, of necessity force into existence a synthetic organic chemical industry, something which we, as a nation, had unwittingly needed for many, many years. Even more strikingly it brought to the attention of industry as a whole the tremendously important role which chemistry could and should play in the production of about everything we need. If we got nothing more than this from the bitter experiences of the last war, it was possibly not too great a price.

With another World War in the offing, into which we all pray we will not be drawn, let us sincerely hope that our chemists continue to "seek the relief of mankind" and to place "a single life above all victories."

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

IMPORTANT NOTICE
To Prospective Employers

Complete personal histories and employment records of the following applicants are now on file at the office of the American Dyestuff Reporter and with the secretary of the Association. These may be examined by prospective employers or copies will be loaned upon application.

A-B-7

Education—Evening school in textile dyeing and chemistry.
Experience—Dyehouse laboratory for 2 years. Foreman dyer and finisher on hosiery for 9 years. Experience on ribbons also vat dyes on rayon and silk skeins. 2 years assistant to superintendent. Desires position either in demonstrating and sales or dyer; New York Viciniy. Age 33; married.

A-B-8

Education—Graduate Chemist.
Experience—Print superintendent, colorist; eleven years' experience in all types of fabrics, specializing on rayon; 8 years' dyestuff laboratory and demonstrating. Excellent references; age 36; married.

A-B-9

Education—Bradford Durfee Textile School, 1918, chemistry and dyeing course.
Experience—Dye application, textile and color chemist; good general factory, laboratory and office experience; accustomed to assuming responsibility; handled all types of help; purchased chemicals, dyes, etc.; executive ability; good personality.
Age 42; American, married; will go anywhere for interesting work; references.

A-B-10

Education—1 year of textile chemistry, day course, Philadelphia Textile School; also business course.
Experience—3 years as apprentice in weaving mill in Germany, office and stock room, general clerical work, practice in all departments of cotton manufacture, dyeing, bleaching and finishing of cotton-rayon mixtures, piece and package processing; several mos. in laboratory of German dyestuff manufacturer, dyestuffs and assistants and their application, vat and naphthol dyeing.
Ago 20; will go anywhere in U. S.

A-B-11

Education: Graduate chemist. Correspond and converse German, some French.
Experience: 3 years dyer; 4 years dyestuff testing, trouble-shooting, purchasing; 4 years demonstrating, consulting, and supervising for large dyestuff manufacturer. Thoroughly experienced on rayon, cotton, silk, acetates, printing, vats. Fullest references as to character and ability. Seeks position as technician, consultant, or superintendent with reliable dyestuff sales organization or dyehouse. Age 33, married.

A-B-C-4

Education—Educated abroad.
Experience—Twenty years experience in the textile field as bleacher, dyer, finisher and chemist. 16 years in charge of dyestuff laboratory of large dyeing plant, 4 years as chief chemist with large bleachery. Has tested dyestuffs, and chemicals used in the textile field and has manufactured soaps and textile specialties. Has handled all textile fibers; bleaching, printing, dyeing and finishing same. Has done pigment and lacquer printing, waterproofing and fireproofing. Reason for leaving last position was due to business conditions.
Age 41; married.

A-B-C-6

Education—English Municipal School of Technology; Board of Education, So. Kensington Chemistry Certificates; City & Guilds of London Institute in Bleaching and Dyeing.
Experience—In U. S. A. 22 years as chemist and chief chemist with one of the largest textile plants in the country; expert colorist; long experience with permanent and semi-permanent finishes. Specialist on vats, naphthols and indigosols. Age 50; married.

A-B-C-7

Education—B.S. in Textile Chemistry and Dyeing, 1939, North Carolina State College.

Experience—None. Seeks position as textile chemist and colorist. Age 21; single.

A-B-C-8

Education—B.T.C., 1933, Lowell Textile Institute.

Experience—5 months as rayon slasher tender; 8 months color matching, dye testing and analytical work; 5 years with large print works in rayon finishing department, laboratory, color matching, dye testing, assistant rayon dyer. Seeks position as rayon dyer, assistant dyer, or any job in a rayon dyeing and finishing plant. Age 29; single.

A-B-C-9

Education—Lowell Textile Institute; chemistry, dyeing and textile finishing.

Experience—Twelve years head dyer in hosiery mills. Dyeing all types of fibers and in combination. Knowledge of all dye applications. Matching and formula making. Charge of every department in a hosiery mill except fixing machinery. Has done jigg work on cottons and rayons. Desires position in hosiery, or in any field. Would like to work as an assistant to head dyer in a woolen or rayon mill. Age 42; married. Will go anywhere in the United States.

A-B-C-D-1

Education—Lowell Textile Institute, Bachelor of Textile Chemistry; Lowell Textile Institute (Evenings), 2 years D. C. Electricity; 2 years A. C. Electricity.

Experience—Six years as chemist and assistant dyer with a large organization. Specialized in dyeing, finishing, bleaching and drying of woolens, worsteds, cottons, rayons and unions in the piece. Some sales experience. Desires position as chemist, dyer, finisher, bleacher or sales. Age 30; American citizen; Married.

A-B-C-F-1

Education—Textile Institute course in Dyeing and Chemistry; Extension work at Brown University; Executive Training with Alexander Hamilton Institute of New York, N. Y.; working knowledge of one foreign language.

Experience—Dyeing executive on all types of textiles including stock, yarns in the skein, warp and package, and piece goods. Thorough knowledge of all classes of dyes and dyestuffs and their successful practical application in the plant. Extensive knowledge of all types and makes of equipment for dyeing, bleaching, mercerizing and finishing. Laboratory practice in testing, standardizing, purchasing, costing, planning and checking processes, and market analysis. Good manager of personnel for better efficiency in retaining friendly labor relations. Conversant with modern methods for quality production economically secured through better coordination and correct alignment in processing, on cotton, viscose and acetate rayon, silk, wool, worsted, and mixtures. In excellent mental and physical health; excellent references.

A-B-C-F-2

Education—Lowell Textile Institute, 1911.

Experience—26 years in cotton yarn and piece goods finishing plants; expert on naphthols, vats and other cotton and rayon dyeing; all types of control work and testing; analytical processes; purchasing of dyes and chemicals. Age 46; excellent references; in perfect health; will go anywhere; married.

A-D-1

Education—Graduate of New Bedford Textile School, 1936.

Experience—Chemist for woolen mill 7 months; technician and salesman for chemical company 1 year and 9 months. Seeks position as salesman or in purchasing department.

Will go anywhere; married; references.

B-5

Education—High School and Textile School Graduate.

Experience—Twelve years overseer of dyeing on directs, vats, naphthols, sulfur, basic and developed colors. Also experienced bleacher. Age 40; married; references.

B-C-3

Education—Graduate, Philadelphia Textile School; speaks German fluently.

Experience—Employed at velvet company for 7½ years. Past 2 years working in finishing department on regular, waterproof and crush-resistant finishes (resin finishes). Can take charge of finishing of velvets. Have some piece dyeing experience.

29 years of age; married; will go anywhere.

B-D-1

Education—General education in England. Chemistry and Dyeing Courses at Huddersfield Technical School.

Experience—Has been a superintendent of dyeing since 1911. Has had experience in worsted mills, hosiery mills and woolen mills. Congenial, sober and reliable. Married; references; age 53.

F-1

Education—Two years high school; 6 years evening engineering school; 1 year evening textile school; 1 year industrial management; course in accounting.

Experience—Ten years in an executive capacity in full fashioned hosiery manufacturing business. Familiar with entire manufacturing procedure, finishing dept., dyehouse and office. Specialized in finishing dept. and has good eye for color, finish and quality. Had responsibility of all orders going through mill, stock, grey goods and traffic. Five months in New York sales office. Gets along well with people and contact with employees and customers has always been satisfactory. Previous to hosiery experience was in a mechanical business for 17 years.

43 years of age; single, in good health; will go anywhere.

REPORT ON PROJECT NO. 2, INTER-SOCIETY COLOR COUNCIL

THE report on Project No. 2 of the Inter-Society Color Council, published in the September issue of the *Journal of Research* of the National Bureau of Standards, "Method of Designating Colors," is now available in reprint form.

The problem dealt with in this report caused the formation of the Inter-Society Color Council, and was presented to the Council by the U. S. Pharmacopoeial Revision Committee at the first meeting. As originally stated, the problem was "to find a means of designating colors in the U. S. Pharmacopoeia, the National Formulary, and pharmaceutical literature; such designation to be sufficiently broad to be appreciated and usable by science, art, and industry, and sufficiently commonplace to be understood at least in a general way by the whole public."

Committees of the Council have been working on a solution for the past seven years. Mr. Kenneth L. Kelly, research associate for the American Pharmaceutical Association, has given his full time to details of the solution during the past three years, working at the National Bureau of Standards under the immediate direction of Dr. Deane B. Judd. In June of 1939 the solution reported by Messrs. Judd and Kelly was accepted by letter ballot of the voting delegates of the Inter-Society Color Council. The method is therefore recommended by the Council for designating the colors of drugs and chemicals, and is tentatively suggested for general use. Final action on recommendation for general use will come after Council committees have had an opportunity to study the application of this color naming method to specific fields of color work covered by the interests of member bodies. It is hoped that members of each society will cooperate in studying the general application of this method, in order to provide a standardized and widely accepted method of designating colors. Any comments will be appreciated. They should be forwarded to Deane B. Judd, National Bureau of Standards, Washington, D. C.

Delegates and individual members of the Inter-Society Color Council have received copies of this report. Other members of the A. A. T. C. C. who desire them may purchase copies from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents each.

Twentieth

ANNUAL MEETING AND CONVENTION

will be held in

NEW YORK CITY

OCTOBER 18TH AND 19TH, 1940

with headquarters at the

HOTEL COMMODORE

Auspices of

New York Section

General Chairman

Patrick J. Kennedy

Linen Piece Goods

(Continued from page 714)

Procedure

End
1. } 4 ends through the reduction bath at 120° F.
2. }
3. }
4. }
5. 2.0 lbs. ammonium persulfate and 1 gallon 56 per cent acetic acid } 30 gal. cold.
6. Run back.
7. 3.0 lbs. soap flakes and 3.0 lbs. soda ash } 100 gal. gently boiling.
8. Run back.
9. Boiling rinse.
10. Shell up through running warm water.

Example II—Untreated Cloth

1,800 Yards—450 Lbs.—3 rolls of 4 Oz. Dress Linen
Shade: Navy

90.0 lbs. Vat Navy Blue

48.0 gallons at 140° F.

The rolls are padded twice through the dye and the wet rolls are transferred to the jigs.

Each jig is prepared as follows:

3.0 gallons caustic soda 70° Tw.
7.0 lbs. hydrosulfite
3.0 lbs. soda ash
1.5 gallons of pad liquor (1/3 of residue from padding)

80.0 gallons at 180° F.

Procedure

End
1. Run cloth through the above dyebath at 180° F.
2. Add 1.0 lb. hydrosulfite and run back. } cooling bath, but not below 140° F.
3. Add 1.0 lb. hydrosulfite and run back. }
4. Add 1.0 lb. hydrosulfite and run back. }
5. Add 1.0 lb. hydrosulfite and run back. }
6. Add 1.0 lb. hydrosulfite and run back. }
7. Add 5.0 lbs. Glauber's salt and run back. }
8. Add 5.0 lbs. Glauber's salt and run back. }
9. Rinse cold in water containing 8 oz. of hydrosulfite.
10. Rinse cold in water containing 8 oz. of hydrosulfite.
11. 2.0 lbs. ammonium persulfate and 1 gal. 56 per cent acetic acid. } 30 gal. cold
12. Run back.
13. 3.0 lbs. soap flakes and 3.0 lbs. soda ash. } 100 gallons gently boiling
14. Run back.
15. 1.0 lb. synthetic detergent. } 100 gallons. gently boiling
16. Run back.
17. Boiling rinse.
18. Boiling rinse.
19. Boiling rinse.
20. Shell up through running cold water.

Many dark shades are very suitably dyed with insoluble azo dyes at a reasonable cost. These dyes exhibit marked brilliancy and fullness and combinations of excellent all around fastness are available. They must be dyed with careful attention to detail if the maximum fastness is to be obtained, especially in respect to crocking. Satisfactory results are obtainable by jig dyeing substantive naphthols and coupling wet. Still better crocking fastness may be obtained by drying the naphtholated roll in a roller hot flue before coupling.

Example I

600 Yards—150 Lbs. of 4 Oz. Dress Linen
Shade: Red

Prepare

Beta hydroxy naphthoic acid beta naphthalide	3.0 lbs.
Solvent	8.0 lbs.
Dry caustic	0.75 lb.

Developer

Stabilized diazo salt of 4 nitro-2 amino anisole	12.0 lbs.
Dispersing agent	1.0 lb.
	25.0 gal.

The naphthol is pasted with the caustic and solvent and water at 180° F. is added until a clear solution results.

The jig is prepared with 75 gallons of water at a boil containing:

3.0 lbs. dry caustic
1.0 lb. wetting-out agent
0.25 lb. synthetic detergent
All the naphthol solution.

Procedure

End
1. Run the dry cloth through dyebath. } gently boiling
2. Run back. }
3. Add 5.0 lbs. common salt. }
4. Add 5.0 lbs. common salt. }
5. Run back. }
6. Run back. } cooling bath.
7. Run back. }
8. Run back. }
9. Rinse cold—20.0 lbs. common salt in 100 gal.

10. Rinse cold—20.0 lbs. common salt in 100 gal.
(Developing bath is made up with 25 gallons of cold water containing 3.0 lbs. of common salt.)
11. Add ½ of diazo solution at start and feed on rest during first end.
12. Run back.
13. Run shell to shell.
14. Run shell to shell.
15. Rinse in copiously running cold water.
16. Rinse in copiously running cold water.
17. 5.0 lbs. soap flakes and 3.0 lbs. soda ash. } 100 gal. gently boiling
18. Run back.
19. 1.0 lb. synthetic detergent. } 100 gal. gently boiling.
20. Run back.
21. Boiling rinse.
22. Boiling rinse.
23. Boiling rinse.
24. Boiling rinse.
25. Shell up through running cold water.

Notes

1. Starting the naphtholating operation at a boil on dry cloth insures excellent penetration.

2. The succeeding ends in a cooling bath both increase the utilization of naphthol and cool down the cloth so that a stripping action will not occur in the salt rinsing bath due to its temperature being increased as high temperature cloth passes through it.

3. Running the last two ends of the coupling operation from shell to shell increases the penetration of the cold developing bath into the fiber.

4. In some combinations it is advantageous to add a pint of 56 per cent acetic acid on the last two ends to neutralize alkali which is deeply embedded in the fiber and which may hinder the coupling or form nitroso compounds which will soap out during the aftertreatment and give the fabric a poorly penetrated appearance.

The use of sulfur dyes on dress linen is usually confined to dark brown and black shades where the use of vat dyes would be too expensive. For the production of these shades sulfur dyes are available with very good light and wash fastness. In the few instances where the cost of dyeing a vat navy is considered prohibitive, and the shade obtainable with diazotized and developed dyes is too dull, a brighter shade of fair fastness is dyed with sulfur colors.

Production of satisfactory sulfur dyeings on dress linen is far more difficult than on cotton, due to the difficulties of keeping the selvedges coincident during jig dyeing, of securing satisfactory penetration, and of prevening the adherence of poorly fixed color which would make the dyeings crock badly. The sulfur dyes suitable for this work are very limited and must be judiciously selected to combine good working qualities and maximum fastness.

Casual consideration would suggest that a dark brown shade could be dyed with colors selected from the many sulfur brown dyes, but experience shows that the most satisfactory result is secured by using a fast sulfur bordeaux, a sulfur orange, and a sulfur black.

Example: 600 Yards—150 Lbs. of 4 Oz. Dress Linen

Shade: Dark Brown

Sulfur Bordeaux	12.0 lbs.
Sulfur Orange	6.0 lbs.
Sulfur Black	0.6 lb.
Sodium sulfide crystals	40.0 lbs.
Soda ash	10.0 lbs.
Synthetic detergent	0.25 lb.
Glucose	2.0 lbs.

Boil up in 25 gallons of water.

The jig is prepared with 50 gallons of boiling water to which is added all the above dye solution, making a total volume of 75 gallons.

End

1. Run the dry cloth through the dyebath.
2. Run back.
3. Add 5.0 lbs. of common salt and run back.
4. Add 5.0 lbs. of common salt and run back.
5. Add 5.0 lbs. of common salt and run back.
6. Add 5.0 lbs. of common salt and run back.

} gently boiling.

7. Rinse in copiously running cold water.
8. Rinse in copiously running cold water.
9. } Aftertreat 6.0 lbs. chrome and 1 gal. 56 per cent acetic. } 40 gal. gently boiling.
10. }
11. Rinse hot.
12. Rinse hot.
13. Shell up cold.

Example: 600 Yards—150 Lbs. of 4 Oz. Dress Linen

Shade: Black

Sulfur Black	30. lbs.
Sodium sulfide crystals	60.0 lbs.
Soda ash	10.0 lbs.
Synthetic detergent	0.25 lbs.

Boil up in 30 gallons of water.

The jig is prepared with 50 gallons of boiling water to which is added the above dye solution, making a total volume of 75 gallons.

End

1. Run the dry cloth through the dyebath.
2. Run back.

} gently boiling

3. Add 5.0 lbs. calcined Glauber's salt, run back.
4. Add 5.0 lbs. calcined Glauber's salt, run back.
5. Run back.
6. Run back.

} gently boiling

7. Running hot rinse at 120° F.
8. Running hot rinse at 160° F.
9. Running hot rinse at 160° F.
10. } 1.0 lbs. synthetic detergent in 100 gal. } soap 2 ends gently boiling.
11. }
12. Boiling rinse.
13. Boiling rinse.
14. Boiling rinse.
15. Shell up cold through 4.0 lbs. sodium acetate flakes.

Note

While it might seem that there is excessive dyestuff consumption by the above method, experience has shown that the ultimate result well warrants the procedure. The fastness to crocking and to washing with adjacent white material is excellent. A chrome and acetic aftertreatment is not advisable.

The heavy loomstate suiting linens ranging from 6 oz. to 12 oz. per yard are prepared for dyeing by scouring and bleaching in the open width on the jig.

Example: 500 Yard Roll—312 Lbs. of 10 Oz. Linen

The jig is prepared with 100 gallons of boiling water containing:

2.0 lbs. soap flakes
4.0 lbs. dry caustic soda
0.5 lbs. synthetic detergent

End

1. Enter dry cloth into scouring bath.
2. Run back.
3. Run back.
4. Run back.

(1–4: 100 gallons gently boiling)

5. Rinse boiling.
7. Rinse boiling.
7. Rinse boiling.
8. Rinse cold.

The cloth is then bleached by either one of the following processes:

Process I

End

1. 1 gal. of 100 volume peroxide and ½ gal. of sodium silicate—cold.
2. ½ gal. of 100 volume peroxide and ¼ gal. of sodium silicate—cold.
3. Heat to 140° F. and run back.
4. Heat to 140° F. and run back.
5. Heat to 160° F. and run back.
6. Heat to 160° F. and run back.
7. Heat to a boil and run back.
8. Heat to a boil and run back.

(1–8: 25 gal.)

9. Rinse boiling.
10. Rinse boiling.
11. Rinse boiling.
12. Shell up cold.

Process II

End

1. 1.0 lb. potassium permanganate and ¼ gal. sulfuric acid—cold.
2. 1.0 lb. potassium permanganate and ¼ gal. sulfuric acid—cold.
3. Heat to 160° F. and run back.
4. Heat to 160° F. and run back.

(1–4: 25 gal.)

5. Rinse at 160° F.
6. 2.0 lbs. sodium bisulfite anhydrous.
7. 2.0 lbs. sodium bisulfite anhydrous.

(6–7: 25 gal. at 140° F.)

8. Running hot rinse.
9. Running hot rinse.
10. Running hot rinse.
11. Shell up cold.

The intrinsic value of high quality suiting linen and the use of this fabric for cruise and spectator sports wear warrants the employment of the very best vat and insoluble azo dyes. For pastel shades the stabilized leuco vat dyes are very suitable. An adequate range of shades of the best fastness properties is now available, and by their use excellent penetration and levelness is easily secured. They are applied by the same methods described in a preceding part of this article in connection with the dyeing of cambric linen.

Medium and dark shades are dyed with vat dyes by the pad-pigment process. To secure the best penetration, the fabric before dyeing must be impregnated with a wetting-out agent on the padder and dried. A double passage of the cloth through the pigment dye will enhance the absorption of the color by the tightly twisted and closely woven yarns. It is important that a well penetrated dyeing should be produced so that prolonged use of the finished garments will not result in bare spots at the points of greatest frictional wear.

A few dark shades can suitably be dyed with azoic dyes. The cloth is naphtholated at a boil and developed and completed as exemplified by the methods described for the dyeing of dress linen. Particular attention must be focussed on the production of dyeings with high fastness to crocking.

The Textile Chemical Uses of

Sulfamic Acid

J. WAKELIN

UNTIL quite recently amidosulfonic or sulfamic acid, $NH_2.SO_3H$, or its salts, was very hard to procure and was in fact a very obscure laboratory curiosity, while information about its uses was equally difficult to obtain. Now it is learned that a new method of manufacture has been found which will make this chemical relatively inexpensive, especially if consumption increases as much as is expected. Although this acid was

known a century ago, this will not be the first time that a chemical body has been "re-discovered" for commerce and brought from obscurity to the limelight of commercial utility. Many other out-of-the-ordinary substances have experienced the same fate.

According to German Patent 636,329 and U. S. Patent 2,102,350, sulfamic acid may be obtained from two very abundant raw chemical materials: urea and sulfuric acid. Oleum is added to a cold solution of urea in sulfuric acid and reaction ensues, carbon dioxide being lost and the acid precipitates from solution. It is filtered off and recrystallized from water. The equation for the change is given as:

$$CO(NH_2)_2 + H_2SO_4 + SO_3 = 2HO.SO_2.NH_2 + CO_2$$

The free acid is a stable, colorless, odorless, non-hygroscopic solid which dissolves in water to give acid solutions. On being neutralized with bases it gives salts. An unusual fact about this acid is that it gives very soluble salts with many of the heavy metals. The calcium and magnesium salts are soluble, the zinc, copper and lead salts being also soluble. The latter metal sulfamate, unlike most other of its salts, is readily soluble in water.

Most of the recorded uses of sulfamic acid relate principally to its reactions and to its use in chemical synthesis, but one very interesting sphere of application relates to the simple alkali salts and was discovered by Imperial Chemical industries Ltd. and is disclosed in a recent patent.

It is found that the addition of sodium or ammonium sulfamate to solutions of soap or sulfated fatty alcohol detergents for textiles is advantageous and improves the speed of dissolving and their ultimate solubility. It is possible that this is associated with the known dispersing power of sulfamates and their property of inhibiting the precipitation of certain metallic hydroxides when caustic soda is added. Silver, for example, is not precipitated by such an addition but instead is believed to form a soluble compound $AgH.N.SO_3Na$. Just how far the amino hydrogen is replaceable there does not seem to be any recorded observation but if, for example, calcium could enter and form a complex anion, we might have cause to comprehend the possibilities in washing and regard sulfamic acid as comparable with the polymetaphosphates.

At any rate while the matter is not clear, there is obviously room for much research and investigation which should be both illuminating from the scientific angle, and—who knows—lucrative from the commercial standpoint.

And again, there is something intriguing in the revelation that sulfamates dissolve or disperse heavy metal salts. What effect might they have on the copper and chromium-containing metalliferous dyes?

Another singular property of alkali sulfamates of interest in textile scouring is that they prevent concentrated solutions of soap forming a gel when they cool. It is often convenient to prepare concentrated soap solutions as stock for scouring but if they are to be kept fluid they must be maintained in a hot condition which is frequently fraught with practical difficulties. A 1 per cent solution of soap is a gel at ordinary temperatures but if the soap contains 10 per cent of its weight of ammonium sulfamate, the solution remains fluid on cooling down.

The now familiar sulfated fatty alcohol detergents are not completely satisfactory from the solubility angle. Those which contain 16 or 18 carbon atoms per molecule and which are known to be the best cleansers are also less soluble and more prone to cloud and separate when a warm solution is cooled. 10 per cent of sodium or ammonium sulfamate is again recommended for getting cold solutions which are also clear.

It may be profitable to consider one concrete example of the practical use of sodium sulfamate in the washing of blankets. An 80 gallon bath of water 12 degrees hardness contains 18 ounces of soap, 6 ounces sodium sesquicarbonate and 2 ounces of sodium sulfamate. A load of 30 blankets is run through this bath at 100 to 110° F., and after the first liquor the goods are rinsed and given a second wash in 12 ounces of soap and 2 ounces of sulfamate per the same bath volume at 100° F. The treated material is clean and has an attractive handle and color. It is free from adherent soap and deposited metallic soaps.

In the processes of organic synthesis there are many occasions when sulfamic acid derivatives of various bodies may be formed or used in manufacturing sequences. Here we shall limit our attention to those compounds which have value as wetting agents or auxiliary agents in the coloring of textiles.

During the last decade many new derivatives of fatty acids and fatty alcohols have been brought to light in the search for surface-active chemicals which do not break down in hard water. The limitations of common soap have been ascribed to the carboxyl (COOH) group and the slight solubility of its calcium and magnesium salts. One very satisfactory mode of surmounting this obstacle has been discovered in the conversion of fatty acids to fatty alcohols by reduction with chromite and hydrogen, and then the esterification of the alcohol with sulfuric acid.

The transformation of a fatty alcohol into a soluble and useful ester is reported by the I. G. Farbenindustrie to be achieved by reacting it with sulfamic acid at an elevated temperature. Octadecyl alcohol ($C_{18}H_{37}OH$) treated with sulfamic acid for 20 hours at 110 to 120° C. gives the ammonium salt of octadecyl sulfuric ester. Cetyl alcohol gives the corresponding cetyl ammonium sulfate and the mixture of alcohols obtained by the oxidation of paraffin, on being heated with sulfamic acid gives a water-soluble product. If F represent any aliphatic alcohol radical, then:

$$F\text{-}OH + NH_2.SO_3H \longrightarrow F\text{-}SO_4NH_4$$

The I. G. have become celebrated amongst textile communities for their discovery of the Igepon series of wetting and detergents. The product "Igepon T" ($C_{17}H_{33}$-CO-NH-CH_2CH_2-SO_3Na) is the substituted amide from oleic acid and taurine, amino ethyl sulfonic

acid. The original fatty acid residue still remains but its normal properties are modified by being linked to a sulfonic group through a short carbon chain. This body is but little affected by lime and its aqueous solutions tolerate hardness salts and even acid without marked diminution of powers. Its preparation is, however, perhaps a little involved and therefore costly.

In a patent the I. G. show that a preparation of similar type may be made relatively simply by the aid of sulfamic acid. Thus, the acid chloride of palmitic acid is condensed with sulfamic acid in the presence of pyridine. The resulting palmityl sulfamic acid bears a strong resemblance in chemical structure to Igepon T and is stated to be a strong foaming agent.

$$C_{15}H_{31}\text{-}CO\text{-}Cl + NH_2\text{-}SO_3H \longrightarrow C_{15}H_{31}\text{-}CO\text{-}NH\text{-}SO_3H$$

The amino hydrogen atoms of sulfamic acid are capable of being substituted by other radicals. When both hydrogens are replaced by normal-propyl groups the resulting compound is stated to be useful as a wetting agent for use in mercerizing. A lye solution of 30 degrees Baumé is treated by adding 0.3 per cent of this compound. Raw cotton is immediately wetted, say the I. G. Farbenindustrie.

Many strange but often technically useful facts are hidden away in the technological literature in the most unlikely places and as an instance of this we would quote the report that sulfamates increase the yield when preparing phthalocyanine pigments.

Many readers will have at least heard of the so-called "Monastral Blue" pigments which have gained so much popularity in the lacquer, wallpaper and similar industries on account of their tinctorial purity and the permanence of their color. These bodies are made by heating together phthalonitrile ($C_6H_4(CN)_2$) with salts of copper or magnesium. The excess of the reactants is removed by washing the resulting mass with acetone and the pigment is purified by solution in sulfuric acid followed by precipitation on dilution.

The original method of manufacture from nitriles has been superseded by the use of phthalic anhydride and urea which apparently gives the same final compound. For example, it is proposed to heat together at 210° C. phthalic anhydride, urea, cupric chloride and ammonium sulfamate.

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Textile Patents and Trade Marks*

HARRY PRICE**

ALTHOUGH textile patents and trade marks are both regarded within the province of a patent attorney, nevertheless, the basis for protection of trade marks is quite different than that for the protection of inventions by patents.

The Constitution of the United States contains a provision providing for the protection of designs and other types of inventions. Protection by patents grew up originally out of the monopolies which were granted by the Kings of England during the years preceding the seventeenth century, which monopolies were utilized by the King as a means of raising revenue.

At the present time, the underlying idea, both in the United States and in foreign countries, is that by granting such patents, the Government encourages the development of the arts and promotes commerce and industry.

Trade marks, on the other hand, are based upon the common law and are inherently connected with the right of the business or merchant to have its or his good name protected, and the Courts have always tried to protect both manufacturers and merchants as well as the public from attempts of other people to palm off their products as the products of a reputable or well known manufacturer.

Trade marks are regarded as an identification of the merchandise which will enable the public to determine its source, and it is considered that the public in buying merchandise on the basis of a trade mark rely upon the reputation of the manufacturer and merchant, as the case may be.

Although there is a federal statute regarding trade marks and varying statutes in almost every State in the Union, nevertheless, these statutes merely affirm the ownership of the mark and give better remedy to persons who have already acquired ownership of trade marks by usage thereof.

In respect to trade marks, although one does not ordinarily think of ingenuity or invention being involved therein, it does involve considerable thought to devise a satisfactory trade mark.

In devising a textile trade mark, it is usually desirable to pick not a name which is descriptive—such as "strong," "durable," "lasting," "dull," "abraded," which describes the properties of the textiles and therefore is not subject to exclusive appropriation—but it is desirable to pick out a name which is suggestive of the properties of the fabric or textile without being directly descriptive thereof.

One of the suggestive trade marks of this character

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**Richards & Geier.

which was sustained by the Courts is the trade mark "HOLEPROOF."

A mark such as "VELVERAY" which is applied to certain types of fabrics is even less suggestive, but has proven to be quite a desirable trade mark, so much so, that it involves considerable effort on the part of the owner to prevent members of the textile industry from referring to flock printed fabrics in general as being "Velveray."

It is very possible for a trade mark to become a word to identify a commodity rather than a means of identification of the manufacturer or seller of the commodity, and if this occurs, as it did occur in the case of aspirin, exclusive trade mark rights therein may be lost. It is, therefore, important for every manufacturer and seller of fabrics or garments to prevent reference to a class of merchandise which he manufactures by his trade mark as a term of a description of the commodity rather than a term of identification of the manufacturer or the source of supply.

A name like "CELANESE" is almost devoid of descriptive qualities, except for its first syllable "CEL" which is taken from "cellulose acetate" and the value of such a mark, as many other types of marks, is often due to the tremendous amount of advertising which has gone into the mark and the widespread reputation of the product with the public.

A mark of this sort becomes so popular that there is a strong tendency for many persons in the field to attempt to use syllables of it or portions of it as component parts or elements of other trade marks which they themselves try to devise. To overcome this, the owner of this mark has made a practice of using and registering in the United States Patent Office, a long list of trade marks including the initial syllable "CEL," or the final syllable "ESE" of their main trade mark "CELANESE."

In respect to designs, they ordinarily require a degree of invention and ingenuity quite different in character than that required for the ordinary textile patent.

As long as styles are such an important factor in feminine life, it seems that designers will be able to originate almost an infinite number of designs, new ones for each season, for both the fabric itself as for the article into which it is fashioned.

The United States Government grants a special type of protection for these designs which is usually for a three and one-half year term which may be extended for a seven or fourteen year term before issuance of the patent.

Once upon a time a considerable length of time was required to obtain a design patent so that the style or fashion not only appeared upon the market but also was pirated and destroyed before the design patent was issued.

Now by prompt action on the part of the designer, it is possible to obtain the design patents quite speedily, so that if there is no undue delay, they can be caused to issue at the same time as the style widely appears upon the market.

Where there is piracy in case of a new and novel design, it is then readily possible to bring suit and to discourage any infringement because of the heavy burden which is placed upon the infringer in defending such a suit.

Ordinarily a design is not patentable if it is for minor variation over an older well known design.

It has been the practice in the dress trade for an expensive French model to be brought into this country following which it is imitated in successively lower price ranges until by the time the style gets down into the cheapest price range, the basic style is the same, but a little lace or a flower or two has been added thereto.

Where a design patent has been obtained for such a style, the Courts are quite prone to hold such patents invalid if they are presented with the original model or a picture thereof from a fashion magazine of which the patented design is a third, fourth, or fifth hand copy, but such decision on the part of the Court does not indicate that the original design was not patentable.

Another difficulty with design patents resides in the fact that often old motifs return and may be popularized by some enterprising fabric or dress concern, but unless there is a substantial difference in appearance, the Courts do not regard such designs as subject to renewed patent protection since once the design is in the public domain, even though it is difficult to repopularize the idea, the patent laws hold that exclusive protection cannot thereafter be obtained.

There have been some proposals to increase the protection of designs by adoption of a copyright law which would merely require that the samples of the design or reproductions thereof be registered with the United States Patent Office or the Copyright Office which would enable one immediately to proceed against the imitators or infringers.

However, there appears to be little chance that any such legislation will ever be passed now or in the near future because of the public policy favoring free competition.

It apparently is not the intention that people shall obtain monopolies too readily even though they may be designers and inventors and there has always been a tendency on the part of Congress and the Courts to safeguard what may be regarded as inalienable right of competitors to imitate one another unless the necessary fees and requirements in connection with patent protection have been met by the inventor or designer or company employing the same.

The real romance of textile patents, however, is associated with what might be termed constructional or mechanical patents.

This form of protection does not cover the name by which the textile may be called nor does it cover the appearance of the textile, but it covers the construction of the machine or mechanism by which the textile is prepared or made, as well as the construction of the yarn or textile fabric itself, the method of forming it into articles of clothing or other articles, the methods of treating the yarns and fabrics before they are processed to form fabrics, the methods of finishing, bleaching, dyeing and

otherwise processing them during or after they have been constructed and also in this field may be included the various chemicals particularly designed to treat the fabrics by way of preparatory treatments or finishing, bleaching or dyeing treatments, although many of these chemicals have seen much broader use than in the textile fields.

Every American schoolboy has heard of the invention of the cotton gin and the sewing machine, the beginning and end of the textile procedures, one being employed in the first state of preparing the fiber from the plant to be converted into the yarn, and the last for the purpose of forming the fabric already constructed into a garment.

However, long before the nineteenth century, there had been great developments in textile machinery and the basis of the factory system had already been laid in England.

Up to the beginning of the eighteenth century, there had been little change in methods of making yarns and of weaving fabrics from methods which had been used for centuries.

In 1733, the first important advance was made by John Kay who invented the fly shuttle to take the place of the old manual method of passing the shuttle by hand through the warp which at that time had been used. This fly shuttle was manually operated and forms an essential part of the modern loom.

The noise of the flying shuttle is the thing which impresses itself most forcefully upon a visitor to a weaving plant and in spite of numerous inventions made, and patents which have been secured for shuttleless looms, the use of the flying shuttle is still almost universal.

The experience of John Kay, however, forms a constant pattern for all other inventors who did so much in advancing this field and in changing the industrial life of England.

As soon as John Kay introduced his invention, apparently those in the industry divided into two groups, one group regarding the invention of John Kay as closely approximating work of the devil which was to be destroyed as quickly as possible, and the other group determined to make use of the invention without paying anything to Kay. As a result, Kay had to shift from town to town and finally he died in exile in France.

Further developments in the middle of the eighteenth century shifted to the improvement of yarn and after early work by Wyatt and by Hargreaves, Richard Arkwright devised and commercialized the first roller spinner. Arkwright secured his first patent in 1769 and after he had had considerable commercial success, his patents were annulled in 1785, but he still retained an outstanding commercial position in the field.

The Court invalidated his patent upon the ground the invention was not his, but had been derived from some other inventor. In view of the fact that it was apparently a standard practice for inventors in the textile field to die penniless, some support for the Court's holding might be found in the fact that Arkwright died leaving an estate of about two million dollars.

The inventions of Wyatt, Hargreaves and Arkwright had so improved and speeded up the production of yarn that difficulty was now experienced in getting sufficient supply of cotton to be spun into yarn and there was also considerable difficulty in disposing of all the yarn which was produced.

This economic pressure then apparently resulted in the development of the power loom by Cartwright who secured his patent in 1785.

Shortly thereafter, about 1805, Jacquard developed the jacquard loom in France and this was the last great development in textile spinning and weaving.

At the other end of the textile procedures, Eli Whitney in the United States in 1793 invented the cotton gin to speed up the production of cotton fiber. Whitney was not able to enforce any patent monopoly and in the various Southern States, organizations were set up whose aim was to avoid payment of tribute to Whitney.

Following these inventions and during the nineteenth century, many additional less basic improvements were made, many of which were made in the United States.

The recent principal improvements in looms seem to have for their primary object to change the looms in such a way that a weaver will be able to take care of a few more looms.

The early part of the twentieth century and particularly the period following the first World War will be noted for the development of synthetic yarns and methods of chemically finishing and preparing the same.

At the time of the World War, production of rayon was relatively unimportant although the basic cellulose nitrate, cuprammonium, viscose and acetate methods had already been devised and patented by Chardonnet and others as early as the period of 1884 to 1900.

Some of the most interesting recent developments have been in the field of permanent finishes for which many patents have been secured involving different types of treatments for the purpose of giving one effect or another to a textile yarn or fabric.

One of the first permanent finishes of wide renown was the Mercer finish which was covered by a patent issued in 1850.

The first finish devised by Mercer omitted the stretching step which only was developed much later in 1890 to give the glossy appearance to cotton fabrics.

Shortly before the first World War, there were discovered in Switzerland, methods of giving permanent wool-like, linen-like and organdy finishes to cotton fabrics.

One of the most interesting of more recent treatments of fabrics to improve their quality is the crush-proofing procedure which was patented in the United States in 1929.

With the replacement of silk with rayon and with the

replacement of spun silk pile of velvets with a rayon pile, the problem of creasing and crushing of cellulosic fibers became quite serious.

Although linen and cotton fabrics were both readily subject to creasing, the matter of solving this difficulty apparently was not given serious consideration until the same problem arose in connection with regenerated cellulose fibers.

The patent which originally issued called for impregnating the fibers with a small amount of a synthetic resin such as urea-formaldehyde or phenol-formadlehyde resin, which resin was afterwards insolubilized and permanentized by heat treatment.

Now it happens that longe before the date of this invention persons had treated or processed fabrics with solutions of synthetic resins to aid in dyeing or printing, to assist in adhesion of fillers and otherwise to improve the qualities of the fabric, but these prior art patents in general were devoid of any mention of crush-proofing or crease-proofing.

Immediately the question arose if some of these prior procedures produced a crease-proof or crush-proof result, without saying so, or without knowing it, whether this be sufficient to invalidate the crease-proof or crush-proof patent.

However, there is no question but that the issuance of this patent in 1929 made the textile field crease-proof conscious and that it resulted in the improvement of many types of fabrics so as to make them more crease and crush resistant and it is very possible that a Court might be inclined to favor the side which had initiated commercial development of a procedure even though there might be considerable doubt as to the novelty of the procedure.

On the other hand, this crush-proofing patent illustrates another difficulty which so frequently arises. The inventors did not apparently realize the breadth and scope of their invention and had probably thought that the invention was primarily of importance in its application to cotton and rayon flat fabrics. Later on, it was found that the invention was of great importance in application to rayon pile velvets, which were susceptible to crushing.

This improvement in rayon pile velvets was worked out in France, which work, although possibly suggested by the crease-proofing patent of 1929, nevertheless, proceeded along independent lines.

In case of such a conflict, of course, the problem would be presented to the Court as to how far should the crease-proofing patent of 1929 be extended to cover a parallel, although independent development in respect to crush-proofing a velvet.

These problems, presented in connection with the crush-proofing patent, arise in connection with many patents in this field, and it is somewhat confusing to the layman to realize that the validity or invalidity of a patent or question of infringement of a patent is by no means an absolute one that may be determined with certainty beforehand, but depends upon the exact circumstances under which the question arises in the Court and the conduct and behavior of the propcnent of the patent as well as the alleged infringer.

An important factor in the mind of the layman, that is should the inventor be awarded for his invention, is usually not most important in Court proceedings.

The reason for this is that the suit is usually between two large corporations and reward to the inventor seems quite remote, although the decision of the Court may have the effect of interpreting the patent law in such a way as to increase or decrease the scope or value of patent protection which the inventor can obtain for his invention in the future.

Moreover, in the Court, unfortunately, and to a greater degree in the Patent Office, the invention is more or less presented as a paper matter as a description and series of claims written without full realization of the commercial situation.

It is a rare patent which comes into Court without a large number of prior patents showing close approximations over which in many instances the patent in suit makes only a relatively small change.

To the industry, it may seem that the patent has been a great step forward but to the Court and to the Patent Office with all of this prior paper material before them, it often seems that the patent involves little in the way of an advance in the useful arts.

Although the field of yarns has been pretty well explored and many variations have been patented, new developments are constantly taking place.

There is a suit at present pending in Delaware involving several patents covering the abrading or cutting of filament yarns to give them a wooly or softer appearance and other patents hae been issued for combinations to give yarns having desired decorative, tensile or other qualities.

There is always a question presented as to whether these yarns are patentably new or whether the change in the yarns is of such small degree as not to constitute an invention.

Fortunately, many of these patents which I have been describing, do not become involved in litigation, or if suit is brought, such suits are frequently settled to the mutual, although not absolute satisfaction of the contestants.

However, the issuance of a patent to a firm or concern usually gives such firm or concern a substantial commercial advantage and it is one of the factors that causes much progress in the many textile industries since a valuable invention may often upset the customary inertia in a particular branch of the textile industry.

With new and better yarns of synthetic origin constantly coming upon the market and with new and unusual finishes being developed, it does seem that in the near future, the primary development will be in textile chemistry rather than in textile machinery, although there is great room for improvement in the latter.

OBITUARY

M. A. R. BRAHAM

MELBOURNE A. H. BRAHAM, secretary-treasurer of the Arkansas Company, died suddenly on December 1 of an acute cardiac ailment at his home in Summit, N. J.

Mr. Braham was only 47 years old, and had spent 27 years with the company which he helped to build. During that time he gained a wide acquaintance throughout the textile industry by his activity on behalf of various associations in the trade. Progressive and genial, Mr. Braham made a host of friends who will mourn his passing.

He is survived by his wife, his mother, three daughters and two brothers.

• GENERAL ANILINE REPORT

The General Aniline and Film Corp., formerly the American I.G. Chemical Corp., and its subsidiaries showed a consolidated net income for the nine months ended on Sept. 30th, of $2,936,004 after Federal income taxes, debenture interest, $1,064,178 provision for depreciation, minority interest and other charges, according to the report of D. A. Schmitz, president. This is equivalent to $3.67 a share on 500,938 shares of common A stock and 37c a share on 3,000,000 common B shares.

• SHORTAGE OF DYESTUFFS IN INDIA

The European War has seriously affected Indian imports of textile chemicals and dyes, according to a report from the American Consul at Bombay made public by the Department of Commerce today.

During the fiscal year ending March 31, 1939, imports of coal tar dyes aggregated 12,000,000 pounds valued at $9,349,000. Of this total, Germany supplied 7,900,000 pounds, valued at $6,098,000.

The American Consul has been requested by the Millowner's Association, representing more than 100 mills, as well as many manufacturers, to ascertain how much of the needed materials can be supplied by United States manufacturers.

Accredited American firms wishing more complete data regarding India's needs of products should contact the Chemical Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.

• ROHM & HAAS RELEASE

Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa., has recently released the fifth in a series of circulars describing the RHoplex Resins. The series presents a discussion of the outstanding properties of these aqueous dispersions and suggestions for their application to textiles. Copies are available upon request.

• HOSIERY CARD SPRING FORMULAS

As has been customary Geigy Co., Inc., 89 Barclay St., New York City, has prepared formulas for the Spring 1940 Hosiery Shades.

They have continued making their suggestions on chiffons, footnoted with recommendations for variations in formulas to produce these shades. It is stated that they feel certain that you will be pleased with the results secured with these formulas in practice. Copies are available upon request.

• HERCULES CHANGES

The Naval Stores Department of Hercules Powder Company announces the transfer of Frank U. Rapp from Charlotte, N. C,. to the home office in Wilmington, Delaware, where he will be supervisor of Hercules pine oil sales.

Willis A. Haines, formerly located in the Chicago office, succeeds Mr. Rapp in Charlotte as sales and technical service representative for Hercules' naval stores products serving the textile industry in the South.

• NEW KELCO REPRESENTATIVES

As a part of the Kelco Company program of expansion, who are the manufacturers of Keltex, a print paste thickener, they announce the addition of two new representatives in their Central Division—E. F. Gore will have headquarters in Indianapolis and M. L. Lamphere will have headquarters in Kansas City, according to Mr. W. R. Kiely, Sales Manager of Kelco Company.

• CHEMICAL FOUNDATION MEETINGS

At a meeting of the Trustees of The Chemical Foundation, Incorporated, held on November 22nd, Terence J. McManus and Dr. James Alexander Miller were appointed Trustees. Mr. McManus is the senior partner of the law firm of McManus, Ernst and Ernst. He was formerly assistant district attorney of New York County under John R. Fellows, and is now secretary of the New York County Lawyers' Association. Dr. Miller is one of the outstanding authorities on tuberculosis. He has served as president of the National Tuberculosis Association and has been a director and officer in other medical organizations. During the World War, he served as Major with the American Red Cross in France.

It was also announced today that at the meeting of the Board of Directors of The Foundation held on November 25th, the following officers were elected: President, Francis P. Garvan, Jr.; Vice-President, George J. Corbett; Treasurer, William W. Buffum; Secretary, Edward J. Muhs. Mr. Garvan assumes the office of President which was held by his father from the formation of The Foundation until his death in November, 1937. He graduated from Yale University in 1935 and from the Law School of Georgetown University in 1938. Mr. Corbett was a law partner of the late Mr. Garvan who played a major part in the development of the American chemical industry.

• TEXTILE COURSES

Of interest to men and women engaged in the textile business are two Massachusetts University Extension courses, "Rayon and Synthetic Fibers" and "Instruments for Consumer and Industrial Testing," which will be offered by the State Department of Education during the coming winter months.

Both courses will be given by Erwin J. Saxl, Consulting Physicist and Chemist, on Tuesday evenings, starting January 23, at the Massachusetts Institute of Technology, Building 1, 77 Massachusetts Avenue, Cambridge.

The course on "Rayon and Synthetic Fibers" meets at 8 o'clock, and is intended for those interested in the manufacture, use, testing and selling of man-made textile materials, the synthetic fabrics of today and tomorrow. There will be discussion of modern methods of manufacturing artificial yarns and other synthetic materials, such as Rayon, Cellulose-Acetate, Nitro-Cellulose, Cuprammonium, Glass, Lanital, and Synthetic Wool. The differences in the physical and chemical characteristics of the synthetic yarn will be shown as they influence the handle and feel, the elasticity, luster, warmth, and other physical factors influencing the acceptance of the new materials by the consumer. A visit to one of the largest rayon plants is contemplated, where actual conditions of manufacturing may be seen.

The other course, "Instruments for Consumer and Industrial Testing," meets at 6:30 p.m., and will offer instruction in the methods of determining the value of materials purchased, whether raw products for industry, such as wires, textiles and rubber, or consumer goods such as textile materials and finished rubber prod-

ucts. It will also present the data necessary for a scientific basis of comparison of different products, materials, and claims, and will discuss methods of standardization and recording by the aid of testing instruments in industrial production, purchasing and selling.

Actual testing instruments in action will be demonstrated during the lectures.

Information concerning these courses may be obtained by writing James A. Moyer, Director, Division of University Extension, State Education Building, Newbury and Exeter Streets, Boston.

• HERCULES DIVIDEND

The Board of Directors of Hercules Powder Company on November 29th declared a year end dividend of $1.65 a share on the common stock of the company.

This is payable December 22, 1939, to stockholders of record at the close of business on December 11, 1939.

• NEW CLOTH PERCH

A new cloth perch has been designed by Birch Bros., Inc., 32 Kent St., Somerville, Mass., to supplement their finished perch, weave room perch, and floor type perch by offering a ceiling type perch at a moderate price.

The machine has forward and reverse draw rolls, an inspection board, and a variable speed drive from an individual built-in motor. A speed variation from 1 to 80 yards per minute is obtained by simply turning a handle. The machine is started and stopped by a lever at the bottom of the inspection board or if preferred by a foot operated lever.

It is made in all widths and is so designed that the finished face of the cloth does not touch the draw rolls.

• OPEN FORUM •

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

47—In recent months we have experienced an entirely new trouble, the very uneven package dyeing of several lots of mercerized yarns, both high grade Combed Peeler and Sak, and both warp and skein mercerized. Satisfactory formulas and methods in the same dyeing machines on the same day act entirely differently on different lots of yarn, therefore methods or water or machines or dyestuffs are not responsible. The dyeing is uneven and the shade is entirely off. On the worst yarn lots there is an actual precipitate from the dyestuff on the outside of the packages. The dyeing is direct, also developed. The worst yarn is also troublesome in skein Vat Dyeing, not in unevenness but in consuming 20 per cent too much dyestuff. The yarn which dyes unevenly with direct dyes in packages can be dyed nearly evenly in skeins with special care. The package dyeing is done in the original wetting out bath and no betterment when the yarn is separately boiled out with scouring or soluble oil. None of the troublesome yarn shows an alkaline reaction from imperfect souring but in some cases a slight souring before dyeing has helped and in other cases no. We notice the most troublesome yarn takes many times as long to wet out in the standard laboratory wetting out test as the satisfactory yarn but in the uneven dyeing we are sure the yarn was properly wet out. In other words the troublesome yarn seems to be to a certain extent waterproofed and to have a precipitating effect on dyestuffs. There are certain chemicals used on Cotton, which are permanently absorbed by cotton and which produce results identical with the above, but the spinners say they use no chemicals whatever and the mercerizers use only caustic and proper souring procedure. What do you say is wrong with the troublesome lots of mercerized yarns and can you suggest remedies? **G.L.**

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Chemist desires position. Twenty-seven years' experience. Fast colors, new finishes, all types laboratory work, yarn, piece goods, cotton or rayon. Excellent health. Write box No. 212, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Piece goods dyer for small but rather complicated job in Philadelphia. Fine wool and hair and cotton and wool coatings. Must be thoroughly experienced in handling union and acid colors. In reply give former experience, age, religion and education. Write Box No. 218, American Dyestuff Reporter, 440 Fourth Avt., New York, N. Y.

POSITION WANTED: Hosiery dyer, 25 years' experience in two leading mills on silk, silk mixed and rayon. Can produce desired finishes at minimum cost. Capable taking full charge. Would consider assistant to head dyer. Age 44. References. Write Box No. 219, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.